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GEOLOGICAL SURVEY

Rates of Sediment Disruption by Sea Ice as Determined from Characteristics of Dated Ice Gouges Created Since 1975 on the Inner Shelf of the Beaufort Sea, Alaska

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RATES OF SEDIMENT DISRUPTION BY SEA ICE AS DETERMINED FROM CHARACTERISTICS OF DATED ICE GOUGES CREATED SINCE 1975 ON THE INNER SHELF OF THE BEAUFORT SEA, ALASKA

by Peter W. Barnes and Douglas M. Rearic

ABSTRACT

Repetitive sidescan sonar and precision bathymetric surveys made between 1975 and 1980 were used to assess seafloor changes due to ice gouging along 8 shore-perpendicular corridors, and to gain insight into the question of when, where, and how gouges are produced on the inner shelf of the Beaufort Sea. The percentage of seafloor area impacted annually by ice keels increases from the coast seaward to at least the 25-m isobath, the offshore limit of repeated surveys. Up to 6.8 % of the total seabed area scanned along the roughly 15 km-long corridors was disrupted in a single year. Total seafloor disruption in single km-long segments ranged as high as 60 %. The maximum new gouge incision depth measured is 1.4 m. High gouge densities are associated with wide, shallow "multiplet" gouging events, where long sections of pressure-ridge keels raked the bottom. Small annual variations in the amount and intensity of new gouges indicate rather consistent reworking of the inner shelf by this process. Where shoals occur within survey corridors our seafloor monitoring has documented the predicted sheltering of seafloor areas on the landward side.

INTRODUCTION

Ice interaction with the seafloor forms gouges which influence the sedimentarty structures, morphology and sediment transport on the shelves off northern Alaska (Reimnitz and Barnes, 1974, Toimil, 1978, Barnes and others, 1984). Ice gouges and the gouging process are important considerations for the safty and design of pipelines (Weeks and others, 1984) and for foundations relying on the seabed for stability (Bea and others, 1985). Pipelines will have to be protected from the impact of ice on the seabed either by burial or by defensive strategies such as berms or armor. Seafloor morphology influences the lateral shear resistance of bottom founded structures such as mobile exploration islands as the bond with the seafloor may occur through discontinuous sediment contact points formed by ice gouge ridges and troughs. The intensity of ice gouging is also an important indication of the rate and intensity of ice/seafloor interaction on the shelf. The size, shape and frequency of gouging is reflected in the size shape and frequency of ice contacts with the bottom. In addition the gouge parameters reflect the creation of ice keels of sufficient draft and strength to form gouges.

In this report we present data on the rate and character of ice gouging in the fast ice and inner stamukhi zone (Reimnitz and others, 1978), from a series of repetitive seabed observations extending over 8 years at 8 different sites (Figure 1 and Table 1).

We detail their numbers, depth, width and orientation. These repetitive observations have allowed us to document the year to year variability of ice gouge processes and to determine the relationship to changes in ice zonation that occur from year to year. The results are discussed in light of sediment reworking and in relation to the ice regime. We also present preliminary speculations on the rates of gouging in relation to other sedimentary processes acting on arctic shelves.

Our data are from the inner shelf where open water conditions are most common and where the limited range of our precise navigation equipment is most useful. Thus our observations are biased toward shallow water by the data base (average water depth-15m). We would expect different results when repetitive data are gathered from deeper water where ice and sediment conditions will certainty be different (Reimnitz and others, 1978, Barnes and Reimnitz, 1974).

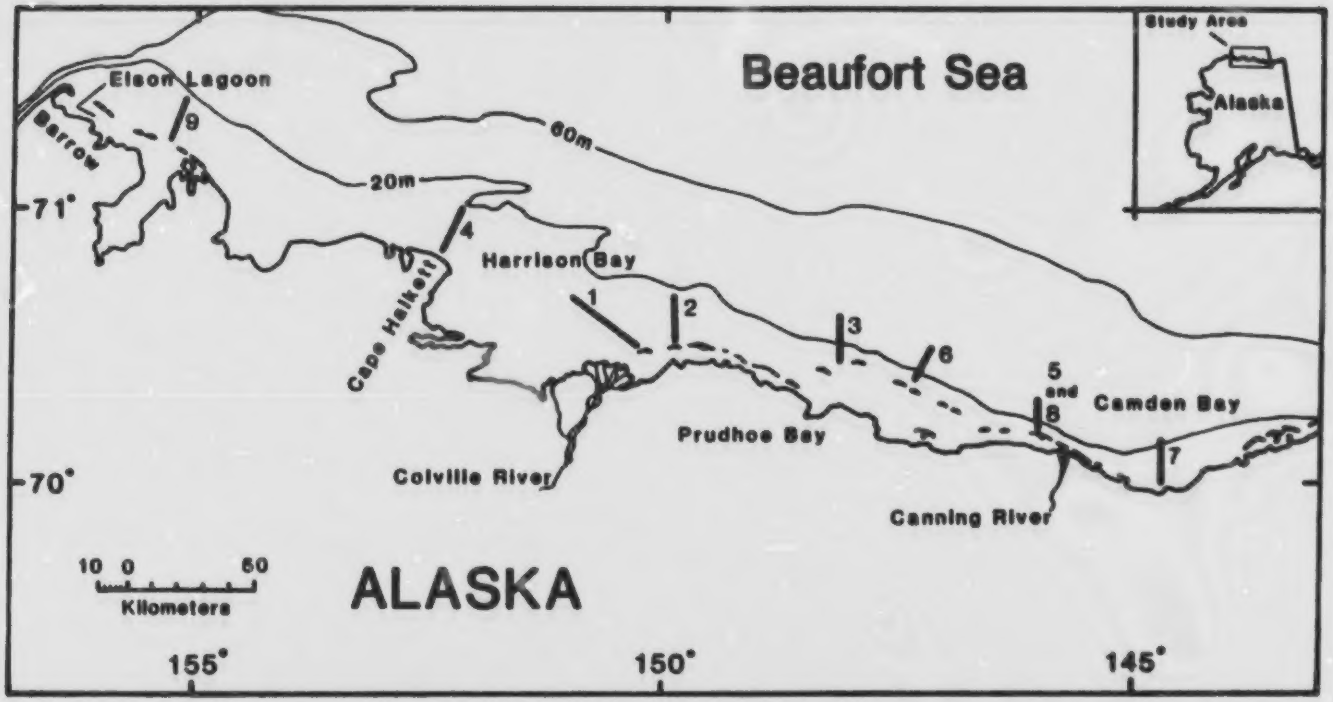
Study Area
Alaska
Beaufort Sea
Elson Lagoon
Barrow
9
60m
20m
71°
4
Harrison Bay
Cape Halkett
1
2
3
6
5
and
8
Camden Bay
Prudhoe Bay
7
Colville River
70°
Canning River
10 0 50
Kilometers
ALASKA
155°
150°
145°

Fig. 1 Location map indicating corridor locations and generalized bathymetry for the Alaskan Beaufort Sea.

TABLE 1.

Location and timing of corridor surveys - Data documentation

Corridor	Baseline Length*	Geographical Name	Survey Year	Time Between Surveys	Trackline Number	Sidescan Roll #	Fathometer Roll #
1	None	Thetis Is.	1975	Base Year			
			1976	1			
			1977	1	35	8	7
			1978	1	14,19	5	8,10
			1979	1	13,33	8,12	9,10b
			1980	1	17	6	12
			1981	1	27	14	18,19
			1982	1	16	8	10
2	None	Spy Is.	1975	Base Year			
			1976	1			
			1977	1	31	6	6
			1978	1	17	5	9
			1979	1	31	10	10a
			1980	1	16	5	11b
			1981	1	26	14	18
3	14936m	Cross Is.	1975	Inadequate data			
			1979	Base Year	92	27	33
			1982	3	12	6	8
4	12622m	Cape Halkett	1977	Base Year	39	12	10
			1978	1	10,11	4	7
			1980	2	20	7	14,15
			1982	2	4	2	2
5	16744m	Flaxman Is.	1979	Base Year	44	15	14
			1980	1	25	9	17
6	21926m	Karluk Is.	1979	Base Year	77	23	27
			1980	1	24	9	17
			1981	1	18	10	13
			1982	1	6	3	3
7	13544m	Camden Bay	1981	Base Year	15	9	11
			1982	1	8	4	5
8	18430m	Flaxman Is.	1981	Base Year	16	9	12
			1982	1	7	3	4
9	17639m	Cooper Is.	1978	Base Year	8	3	5
			1982	4	1	1	1

* Baseline distance is measured between the two shore based navigations stations.

Data Sources (Table 1 continued)

Reports containing data, locations, log sheets, and methodology (records often on microfilm).

Year Collected	Open-File Report No.	Authors
1975	none	
1976	79-766	Reimnitz, Barnes, and Maurer
1977	78-1066	Maurer, Barnes, and Reimnitz
1978	79-384	Reimnitz, Barnes, and Kempema
1979	80-603	Barnes, Reimnitz, Kempema, Minkler, and Ross
1980	81-241	Kempema, Reimnitz, and Barnes
1981	82-586	Minkler, Reimnitz, and Barnes
1982	83-493	Kempema, Barnes, Reimnitz, Asbury, and Rearic

Copies of the Open-files are available at Open Files Services Section, Branch of Distribution, Box 25425, Federal Center, Denver, CO 80225.

Complete microfilm copies of all geophysical records, ships log and computer listings of navigational way ponts, can be obtained from the National Geophysical and Solar-Terrestrial Data Center, NOAA, Boulder CO, 80303.

The original records are archived at the U.S. Geological Survey, Branch of Pacific Marine Geology, 3475 Deer Creek Road, Palo Alto, CA 94304.

Background -

Earlier studies of the rates of ice gouging based on repetitive observations of the seafloor inshore of 20 meters indicated that sea ice presently interacts with the sea bed forming gouges (Lewis, 1977, Reimnitz and others, Barnes and others, 1978). In these previous studies gouging was ubiquitous in the areas studied although data from one study suggested that sediment reworking by waves and currents is important to gouge morphology on the inner shelf inshore of 13m (Barnes and Reimnitz, 1979).

Most ice gouges form in winter when a large semi-ridged ice sheet integrates atmospheric and oceanic energy over a large area and allows this energy to be transmitted through the ice canopy for some distance to the boundary of the ice sheand othersng the continent where ridging and grounding occur (Barnes and others, 1978; Thomas and Pritchard, 1980). This allows more energy to be focused at grounded ice keels in winter than would be available during the summer when a discontinuous ice sheet diffuses atmospheric and oceanic energy over smaller areas and distances. In the summer waves and currents are often the only forces acting on isolated grounded ice blocks.

The earlier repetitive surveys mentioned above have shown the rates of seabed reworking by ice for the Canadian shelf and the shelf off northern Alaska to be on the order of 2% each year with depths of incision ranging up to 120 cm but averaging less than 20cm.

The ice regime in the study area is discussed by Kovacs and Mellor (1974) and by Reimnitz and others (1978). Briefly, the ice environment is composed of a relatively stable winter 'fast' ice sheet up to 2m thick inshore of a zone of discontinuously grounded shear and pressure ridges called the stamukhi zone. The outer edge of the fast ice and the inner edge of the stamukhi zone forms in water depths of 15 to 25m. The boundary is typically composed of linear ridges which parallel the isobaths. Isolated grounded ridges and grounded ice blocks may occur inside of the stamukhi zone. In particular, a stamukhi zone boundary has, on occasions, developed along the 10 meter isobath in Harrison Bay (Reimnitz and others, 1978).

The stamukhi zone is significant in that the atmospheric and oceanic energies imparted to moving offshore polar ice pack are, primarily expended against the continent within this zone. In this regard the stamukhi zone could be thought of as the winter "surf" zone of the Beaufort Shelf. The expenditure of energies results in higher numbers of pressure and shear ridges than elsewhere in the Beaufort (Weeks and others, 1980) and an intensely gouged seafloor (Barnes and others 1984). Inshore of the stamukhi zone, gouging is expected to be less intense and less frequent due to the expenditure of energy by ridge building and gouging processes within the stamukhi zone. Our study is focused primarily on the area inshore of the stamukhi zone and provides only a glimpse of the rates and character of gouging at the inner margin of the zone. The expenditure of energy and rate of ice gouging is expected to drastically increase seaward of our data set in the stamukhi zone (Barnes and others, 1978, 1984).

METHODS

A 42 foot research vessel was used to run repetitive surveys. The basic objective was to establish tracklines which could be reoccupied in subsequent years. The subsequent trackline observations or line sets from the same or nearly the same corridor forms t[illegible] basic data for this report. The navigation and depth observations were correlated with sidscan sonar data (Belderson and others, 1972) which covered a swath of seafloor 125 meters wide on either side of the trackline. This resulted in a "corridor" of the seafloor which was resurveyed in subsequent years. We have arbitrarily numbered these corridors depending on the year in which the initial data were collected (Figure 1 and Table 1).

Navigation

The location of the survey vessel for the initial two survey corridors (1 & 2) was determined by aligning the vessel with two in line range marks several kilometers apart and measuring the vessels distance from one of the ranges (Figure 2). With this technique we were able to carry the line seaward from the islands in excess of 20 kilometers achieving position accuracies of better than 20 meters. The technique was occasionally aided by a thermal inversion which created a "mirage" causing the range markers to appear higher above the horizon and thus visible at greater distances. The common summer fog has made the routine re-occupation of corridors one and two diffucult and time consuming. As a result of this problem and the lack of appropriate range marks, the remainder of the corridors were navigated using precision range-range electronic navigation alone (Table 2). These navigation systems typically give precision ranges to a few meters and repeatable locations within about 10 meters. For simplicity we chose benchmarks and survey lines such that the corridors could be run equidistant from the two shore stations. This meant that the boat operator and navigator were required to keep the vessel equidistant from both shore stations by maintaining the same range from each station.

Ice gouge measurements

The enumeration of new gouges was accomplished through the comparison of sonograph records and fathograms in one kilometer intervals. The starting point for counting began either on

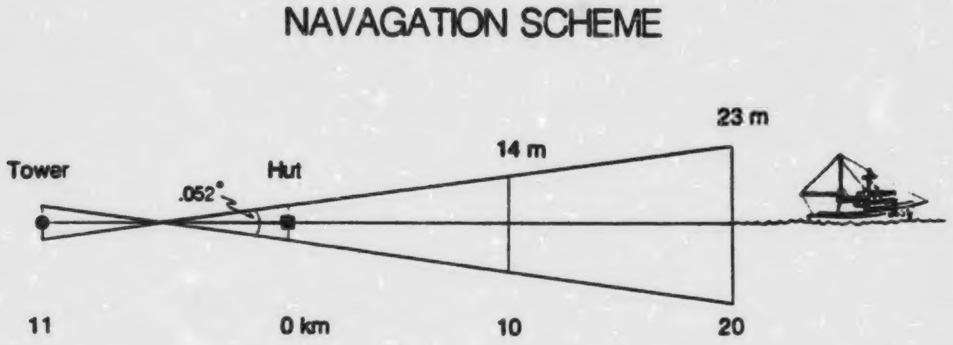
NAVAGATION SCHEME
23 m
14 m
Tower
Hut
.052°
11
0 km
10
20

Fig. 2 Navigation scheme used on corridors 1 & 2 indicating the errors likely to be experienced in aligning the ranges with good visibility.

Table 2

Ranges and benchmarks used for navigating along corridors

Corridor	Course	Navigation (Shore Stations)	Remarks
1	305 T	1) Thetis Is. Benchmark (~ 10m south of hut) 2) Oliktok Pt. 300ft. Tower	Range alignment of Oliktok tower and Thetis Island hut. Distance along line is measured from Thetis Is. or Oliktok.
2	358 T	1) Spy Is. benchmark (under 1950's wooden tower) 2) Oliktok Pt. 300ft. Tower	Range alignment of Oliktok tower and tower over Spy Island bench mark. Distance along line measured from Spy Island or Oliktok.
3	000 T	1) Reindeer Is. tower (USGS tower at Humbolt C-1 well- (lat. 79 29'12"; long. 148 20' 25") 2) Cross Is. (top of USCG RACON tower)	Line is run equidistant from Reindeer and Cross Island.
4	027 T	1) Cape Halkett RACON tower 2) Northeast corner of the sod hut at Esook.	Line is run equidistant offshore from the two stations.
5			One shore location has been lost and the corridor has not been resurveyed.
6	028 T	1) Pole Is. (USGS 50ft. tower) 2) Narwhal Is. (150ft. tower)	Line is run equidistant from Pole and Narwhal Island stations.
7	000 T	1) "Collinson Point" benchmark	Line is run equidistant from the two stations.

		2) Benchmark "Koganak" (~ 13.2km east of "Collinson Point")	
8	006 T	1) Brownlow Point RACON tower 2) Benchmark "Roda" near Point Thompson	Line is run equidistant from the two stations.
9	020 T	1) Cooper Is. NOS benchmark 2) Igilik Is. NOS benchmark	Line is run equidistant from the two stations.

the range/range baseline or one kilometer offshore from a barrier island or coast. One kilometer intervals were scaled off seaward on the navigation charts and the time the vessel crossed the kilometer points was determined. These times were then used to correlate the sonographs and fathograms with the navigation at the established intervals. As pointed out in Wolf and others (1983) systematic errors did occur. Therefore, seabed ice gouge "matches" on sonographs were used wherever possible to establish comparisons between records.

Side-scan sonar records from sequential years were used to determine the number of new (datable) gouges occurring during the year or more interval since the previous survey. The total number of gouges in each segment was also determined. The percent of new gouges to the total was calculated for each interval. Other measurements taken from the sonographs included gouge orientation, gouge width, disruption width of multiplet gouges, and length of gouges (See Barnes and others, 1984, for explanation). The location of each new gouge along the trackline was determined (+/-50 meters) and will allow us to monitor sedimentary processes in the vicinity of the gouge in future years.

Fathogram records were used to determine the maximum depth of the new gouges below the seafloor, maximum height of ridge of plowed sediments from the new gouge, and the water depth at which the new gouge occurred. In the case of multiplet gouges only the deepest incision was measured.

The problem of small gouges

In many cases we were able to resolve individual gouge features on the sonographs that we could not resolve on the fathograms, except to note that the gouge was smaller than we could resolve on most of our fathograms (20 cm). For the large percentage of the new gouges (>60%) that fell into this unresolvable category, we assumed a depth of 10 cm for purposes of our statistical calculations. The assumed depth is probably less than the actual gouge depth for these gouges as the limit of resolution of the sonographs is also near 10cm (based on wavelength), thus the incision depths of the gouges observed on the sonographs and not resolved on the fathograms should fall between 10 and 20cm. From the above it follows that there also exist gouges that are smaller than the 10 to 20 cm resolution of our instruments. These gouges are not accounted for in our data.

Other observations

Observations of interest were noted in the comments column of the data sheets (Appendix). Ice gouge termination directions were determined which indicate the direction of ice keel movement during a gouging event. Sediment wave orientations were determined whenever observed on the sonographs as these have a direct application to sediment movement and infilling. On some corridors, older gouges formed in cohesive sediments are reexposed when non-cohesive sediment cover is redistributed by waves and currents (Barnes and Reimnitz, 1979). These gouges could be misinterpreted as new gouges and, counted in the datable gouge population.

Subjectivity of analysis

Due to many factors, such as record quality, navigational accuracy, ice conditions, etc., enumeration of ice gouge data is a subjective task varying significantly between individuals. In this study, we found that new gouges in water depths of less than about 15 m were generally easy to resolve on the sonograph records and thus least subjective. Dated gouges in water depths greater than 15 m required more subjective decisions due to increased gouge densities (>100/km) on the seafloor and resultant complexity of seafloor morphology at these depths.

To keep the subjectivity consistent throughout the data set , the second author enumerated all of the gouge records. Even with this precaution the data exhibit some inconsistencies, particularly with regard to the number of gouges. Examination of the appendix will show segments where the total number of gouges increases from one year to the next by a number greater than the "new" gouge count.

Occasionally assumptions were made regarding what constituted a datable gouge. Areas exist where there were poor "matches" between sequential sonographs due to deviations from trackline, an extended time between resurveys (generally 2 years or more), or extensive hydraulic reworking of the bottom. In these areas, other criteria were used to determine what gouges could be dated. Superposition of gouges on older gouges, the fresh or crisp appearance of gouge trough and ridge morphology, and gouge orientation parallel to other gouges of the same age were used in determining whether a gouge was considered to have been formed since the last survey of the trackline and was, thus, datable. We estimate that these criteria were used in less than 10% of the 1 km segments and that only 30% of the dated gouges within these segments were accounted for by this method.

Reality of Year-to-year differences in ice gouge parameters

In addition to the year to year variability of ice gouge interaction with the seafloor due to the variability of natural processes, artificial factors based on the survey techniques and data quality enter into the comparative analysis. Ice conditions varied from year to year influencing the length of the survey lines and the ability to reoccupy these lines without "ice detours". In addition some datable gouges may have gone uncounted due to poor record quality, or to rapid infilling or to deviations from the desired trackline. Data summarized for entire tracklines are not strictly comparable area to area or year to year as differing line lengths represent unequal portions of the ice gouge environment.

Variable record quality leads to uncertain correlation from year to year which may have resulted in calling gouges "new" and datable when in reality they may have been poorly defined on previous records. We estimate that at most about 25% overcounting of the gouges may have resulted but that these gouges would consist primarily of the small short and shallow gouges which are the least clear on the sonographs and fathograms in all water depths. We also note that since the initiation of the repetitive surveys in 1975 the quality of our records has improved due to growing skills with the equipment and to advances in equipment design. Thus in recent years seabed morphology was visible in greater detail. This means that the number of "new" features may have increased due to this artificial factor.

RESULTS - OBSERVATIONS and DISCUSSION

The morphologic environments for each of the corridors varied considerably. The corridors were resurveyed during the open water seasons from 1977 to 1982, although only a few years of record are available in some corridors (Table 1). As other workers may wish to reoccupy these corridors the methods of navigation and the location of the shore stations used in surveying each of the lines is given in Table 2. The corridors are described from west to east (Figure 1). The raw data are given in the appendix, and data summaries are shown in Table 3 and Figures 3 through 11.

Corridor 9 - This corridor extends northeast from a chain of sand and gravel islands stretching east from Point Barrow (Figure 1). Depths quickly increase to 5m seaward of the islands then steadily increase seaward such that the 20 m contour is crossed more than 12 km from the islands (Figure 3). There are no noticeable shoals or steps along this trackline. The bottom sediments in this area are muds and muddy sands with the coarser sediments generally occurring further inshore.

Corridor 4 - Another northeast trending corridor which starts in shallow water offshore from a coastline with 1 to 2 meter high tundra bluffs. The waters gradually increase in depth to about 15m where a 1 to 2m high shoal exists (Figure 4). The seafloor continues to deepen seaward from here to depths of 19m, 24 km from shore, then rises a few meters over a broad shoal at the outer end. The sediments along this corridor are characterized as muddy sands and sandy muds, although there is no onshore/offshore pattern.

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Corridor 1 - One of our oldest corridors, originally established in 1973 (Reimnitz, and others, 1977), and one for which we have the most repetitive surveys (Table 2). The trackline extends northwest from Thetis Island on the eastern side of Harrison Bay (Figure 1). The bottom drops quickly to 7 m seaward of the island, then gently and rather uneventfully to water depths of 15 or more meters in the central part of Harrison Bay (Figure 5 and 6). The sediments along this corridor are sands and muddy sand inshore; offshore the porportion of muds increases.

Corridor 2 - Extending north from Spy Island in the northeast corner of Harrison Bay, this older corridor (established in 1975) is marked by 2 to 3m high sand shoals in water depths of 12 to 15m (Figure 6 and 7) before reaching its seaward limit at water depths near 20m. Except for the sand shoals the sediments along this corridor are sandy muds which generally become finer in a seaward direction.

Corridor 3 - Although also established in 1975, this corridor has been seldom repeated due to the persistence of ice in this area. The corridor extends north equidistant from Cross and Reindeer Islands, offshore of the Prudhoe Bay area (Figure 1). The bottom profile in this corridor is steeper than on the corridors to the west (above), as are the profiles from here eastward to Camden bay (Figure 8). Proceeding seaward, corridor 3 crosses a mound 4 m high in 13m of water then drops to about 19 m before rising gradually to a small shoal or bench between 18 and 22m water depth (Barnes and Asbury, 1985). The mound is composed of sands and gravels while the sediments elsewhere along the corridor are sandy muds and muds. Just inshore of the break in slope at 18 to 22m the bottom sediments are an over consolidated mud, which is common here and elsewhere on the shelf (Reimnitz and others, 1980).

Corridor 6 - Extending northeasterly from the chain of islands north and east of Prudhoe Bay (Figure 1), this corridor's steep profile crosses a bench at 18m and continues dropping to water depths of more than 25m (Figure 9). The sediments in this area are quite varied and are commonly over- consolidated. Sediment descriptions include pebbly clays and stiff sandy muds. At the innermost end of the corridor boulders up to 50cm in diameter have been observed on underwater TV.

Testline 9-COOPER ISLAND

Kilometers	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16			
Water Depth (m)	6.0	7.7	8.5	9.3	10.0	10.9	11.8	12.4	13.0	13.5	14.0	14.6	15.4	16.2	17.0	18.2	18.7			
No. of New Gouges (m)																		Total	avg/Km	
1978-1982	7	10	16	1	7	5	23	18	12	2	11	4	7	12	16	7		158	9.9	
Maximum Gouge Depth (m)																		Deepest		
1978-1982	.1	.3	.3	.3	.6	1.1	1.1	.7	.9	x	.2	x	x	x	x	x		.1		
Total Disruption Width (m)																		Total	avg/Km	% disturbed (in 4 yr)
1978-1982	19	53	71	13	49	51	159	147	132	23	83	43	72	107	143	86		1250	78.1	7.8

Total No. of New Gouges = 158   Deepest New Gouge = 1.1 m   Total Disruption Width = 1250 m   Mean % disturbed = 2.0

Testline 4-CAPE HALKETT

Kilometers	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27			
Water Depth (m)	x	3.2	5.1	6.8	7.8	8.7	9.5	10.4	11.0	11.9	12.5	13.1	14.0	14.7	15.0	15.4	16.2	16.6	17.5	18.2	18.7	19.0	19.3	19.6	19.9	19.7	19.7	18.5			
No. of New Gouges																															
1977-1978	x	4	6	7	4	4	6	5	4	6	11	24	5	19	98	45	11	21	13	0	6	7	2	0	6	5	5		Total 322	avg/Km 12.4	
1978-1980	x	5	3	0	4	4	5	9	x	x	52	20	10	21	31	x	x												164	13.7	
1980-1982	x	x	0	0	3	1	1	6	x	x	8	13	8	17	19														76	6.9	
Maximum Gouge Depth (m)																															
1977-1978	x	.3	.2	.2	.1	.4	.1	.2	.1	.2	.4	.4	.2	.5	1.2	.5	.4	.5	.5	0	.4	.3	1.2	0	.1	.3	.5		Deepest 1.2		
1978-1980	x	.1	.2	0	.1	.4	.1	.1	x	x	.5	.6	.5	.4	.8	x	x												.8		
1980-1982	x	x	0	0	.1	.1	.1	.2	x	x	.9	.6	.5	.9	.9														.9		
Total Disruption Width (m)																															
1977-1978	x	16	16	13	13	19	16	24	18	36	86	134	24	96	398	321	122	200	68	0	33	34	13	0	29	39	20		Total 1756	avg/Km 67.5	%disturbed 6.8
1978-1980	x	11	13	0	22	14	16	22	x	x	223	77	79	101	212	x	x												790	65.8	6.6 (2 yrs.)
1980-1982	x	x	0	0	6	4	5	20	x	x	46	76	61	134	144														496	45.1	4.5 (2 yrs.)

Total No. of New Gouges = 562   Deepest New Gouge = 1.2 m   Total Disruption Width = 3042 m   Mean % disturbed = 5.6 per year

Testline 1 - Thetis Island

Kilometers	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25			
Water Depth (m)	6.9	5.8	8.3	8.5	9.6	10.1	10.0	10.4	10.9	11.5	12.0	12.4	12.8	13.1	13.6	13.8	14.2	14.6	14.9	15.1	15.2	15.3	15.4	16.0	16.5	16.7			
No. of New Gouges																											Total	avg/km	
1977-1978	0	2	6	0	0	6	0	0	1	10	5	4	15	21	10	0	4	0	0	0	0	10	4	5	0		127	5.1	
1978-1979	4	4	13	20	12	0	1	4	9	7	15	9	2	2	6	24	0	3	0	1	x	x	0				142	6.8	
1979-1980	x	x	16	30	4	64	51	14	10	5	2	0	0	1	3	40	4	x	13	13	0						270	15.4	
1980-1981	x	x	9	15	16	9	2	12	14	15	6	11	15	15	22	30	7	9									207	12.4	
1981-1982	1	0	2	0	10	7	3	2	20	20	6	6	3	3													91	6.5	
	5	6	46	73	62	86	57	32	54	65	34	30	35	42															
Maximum Gouge Depth (m)																											Deepest		
1977-1978	0	.1	.1	0	0	.1	0	0	.3	.2	.1	.1	.1	.3	.2	.3	.5	0	0	0	0	.5	.3	.3	0		.5		
1978-1979	.1	.1	.1	.1	.1	0	.1	.1	.1	.2	.4	.2	.1	.1	.1	.1	.2	.1	.2	.2	x	x	0				.4		
1979-1980	x	x	.1	.2	.1	.1	.1	.1	.1	.1	.4	.3	0	.1	.2	.4	.2	x	.3	.3	0						.4		
1980-1981	x	x	.3	.7	.4	.2	.1	.1	.3	.3	.6	.1	.6	.3	.2	.3	.3	.2									.7		
1981-1982	.1	0	.1	.1	.3	.3	.1	.2	.4	.3	.4	.2	1.0	.5													.0		
Total Disruption Width (m)																											Total	avg/km	% disturbed
1977-1978	0	10	20	0	0	9	0	0	4	70	3	39	102	92	66	60	37	0	0	0	0	49	24	46	0		609	24.4	2.4
1978-1979	8	8	42	59	45	0	3	25	50	24	60	25	6	5	23	101	30	12	33	4	x	x	0				567	25.8	2.7
1979-1980	x	x	71	123	18	170	214	31	43	33	31	62	0	10	27	146	21	0	82	82	0						1164	61.3	6.1
1980-1981	x	x	30	70	58	36	0	64	62	96	71	51	74	52	105	113	35	60									975	60.9	6.1
1981-1982	1	0	10	31	31	29	4	5	58	62	25	62	22	20													360	26.9	2.5
	9	26	173	283	180	248	229	125	217	285	190	209	204	197	201	420	123	52	115	86	0	45	24	46					

Total No. of New Gouges = 845   Deepest New Gouge = 1.0 m   Total Disruption Width = 3659 m   Mean % disturbed = 4.0

Testline 2. - Spy Island

Kilometers	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15			
Water Depth (m)	6.9	10.0	11.4	11.5	12.2	13.3	14.2	14.9	14.4	14.3	15.1	15.4	16.3	17.3	17.9	18.5			
No. of New Gouges																	Total	avg/km	
1977-1978	12	4	1	22	1	30	17	4	23	0	0	13	11	17	7		170	11.3	
1978-1979	0	1	25	44	12	1	0	0	20	0	9	0	1				133	10.2	
1979-1980	0	0	0	21	0	1	2	1	14	0	2	1	4				46	3.5	
1980-1981	2	5	2	25	7	6	2	0	16	7	7	16	19	0			118	8.4	
Maximum Gouge Depth (m)	14	10	28	112	20	38	21	5	71	7	26	28	35	25	7		Deepest		
1977-1978	.1	.1	.1	.1	.1	.2	.2	.1	.1	0	.1	.2	.4	.7	.5		.5		
1978-1979	0	.1	.1	.2	.1	.1	0	0	.1	0	.2	0	.1				.2		
1979-1980	0	0	0	.2	0	.1	.1	.1	.2	0	.1	.1	.3				.3		
1980-1981	.1	.1	.1	.1	.1	.1	.1	0	.2	.4	.2	1.4	.3	.3			1.4		
Total Disruption Width (m)																	Total	avg/km	% disturbed
1977-1978	72	19	3	97	9	134	65	20	50	0	44	58	56	139	60		826	55.1	5.5
1978-1979	0	4	97	149	30	3	0	0	53	0	18	0	4				358	27.5	2.8
1979-1980	0	0	0	82	0	3	15	3	48	0	4	1	15				171	13.1	1.3
1980-1981	11	13	5	121	21	14	4	0	64	20	49	88	88	34			540	38.6	3.9
	83	36	105	449	60	154	84	23	215	20	115	147	163	173	60				

Total No. New Gouges = 447   Deepest New Gouge = 1.4 m   Total Disruption Width = 1895 m   Mean % disturbed = 3.6

Testline 3-CROSS ISLAND

Kilometers	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14			
Water Depth (m)	11.5	12.5	12.3	12.0	15.0	17.8	20.5	21.6	22.4	22.7	22.5	22.2	21.7	21.0	24.1			
No. of New Gouges Depth (m)																Total	avg/Km	
1979-1982	6	7	6	11	9	2	5	3	0	4	0	22	8	134		217	15.5	
Maximum Gouge Depth (m)																Deepest		
1979-1982	.1	.1	.1	.1	.1	.2	.2	.1	0	.1	0	.2	.3	.8		8		
Total Disruption Width (m)																Total	avg/Km	%disturbed (in 3 yrs.)
1979-1982	23	22	15	30	25	13	15	9	0	50	0	189	71	600		1042	74.6	7.4

Total No. of New Gouges = 217 Deepest New Gouge = .8 Total Disruption Width = 1042 m Mean % disturbed = 2.3

Testline 6-KARLUK ISLAND

Kilometers	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16			
Water Depth (m)	9.4	8.8	9.5	10.2	11.1	12.0	13.9	14.6	15.7	16.2	19.3	21.7	23.2	25.2	26.6	26.9	27.4			
No. of New Gouges																		Total	avg/Km	
1979-1980	x	x	x	x	3	x	5	4										12	4.0	
1980-1981	0	0	2	5	1	2	0	0										10	1.3	
1981-1982	1	9	1	0	1	10	1	1	1	15	15	0	6	0	0	1		66	4.1	
Maximum Gouge Depth (m)																		Deepest		
1979-1980	x	x	x	x	.1	x	.1	.1										.1		
1980-1981	0	0	.1	.1	.1	.1	0	0										.1		
1981-1982	.1	.7	.5	0	.1	.1	.1	.1	.1	.1	.2	0	.2	0	0	.1		.7		
Total Disruption Width (m)																		Total	avg/Km	% disturbed
1979-1980	x	x	x	x	11	x	16	8										35	11.7	1.2
1980-1981	0	0	3	16	3	4	0	0										26	3.3	0.3
1981-1982	3	15	4	0	6	83	1	5	3	57	98	0	29	0	0	0		264	16.5	1.7

Total No. of New Gouges = 88 Deepest New Gouge .7 m Total Disruption Width = 325 m Mean % disturbed = 1.1

Testline 5 & 8-FLAXMAN ISLAND

Kilometers	0	1	2	3	4	5	6	7	8	9	10	11			
Water Depth (m)	7.1	10.6	11.9	14.1	16.8	19.9	20.5	22.5	24.3	25.8	27.0	27.7			
No. of New Gouges													Total	avg/Km	
1979-1980 (TL5)	1	0	12	12	x								25	6.3	
1981-1982 (TL8)	0	0	12	1	12	2	3	4	1	5	x		39	3.9	
Maximum Gouge Depth (m)													Deepest		
1979-1980 (TL5)	.1	0	.1	.1	x								.1		
1981-1982 (TL8)	0	0	.1	.1	.1	.1	.1	.3	.1	.8	x		.8		
Total Disruption Width (m)													Total	avg/Km	% disturbed
1979-1980 (TL5)	.1	0	29	25	x								55	13.8	1.4
1981-1982 (TL8)	0	0	54	4	50	10	6	10	4	29	x		175	17.5	1.8

(TL5) Total No. of New Gouges = 25 Deepest New Gouge = .1m Total Disruption Width = 55m Mean % disturbed = 1.4

(TL8) Total No. of New Gouges = 39 Deepest New Gouge = .8m Total Disruption Width = 175m Mean % disturbed = 1.8

Testline 7-CAMDEN BAY

Kilometers	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17			
Water Depth (m)	5.5	6.7	7.1	7.4	8.2	9.0	9.5	10.2	10.8	11.7	12.5	13.0	14.3	15.0	15.9	16.8	17.7	18.6			
No. of New Gouges																			Total	avg/Km	
1981-1982	2	2	2	7	2	15	8	8	4	9	14	23	15	9	18	12	1		151	8.9	
Maximum Gouge Depth (m)																			Deepest		
1981-1982	.1	.1	.1	.1	.1	.2	.1	.3	.1	.1	.1	.1	.3	.2	.7	.4	.1		.7		
Total Disruption Width (m)																			Total	avg/Km	% disturbed
1981-1982	4	9	4	20	5	50	30	40	14	38	32	68	71	28	95	66	3		577	33.9	3.4

Total No. of New Gouges = 151 Deepest New Gouge = .7 m Total Disruption = 577 m Mean % disturbed = 3.4

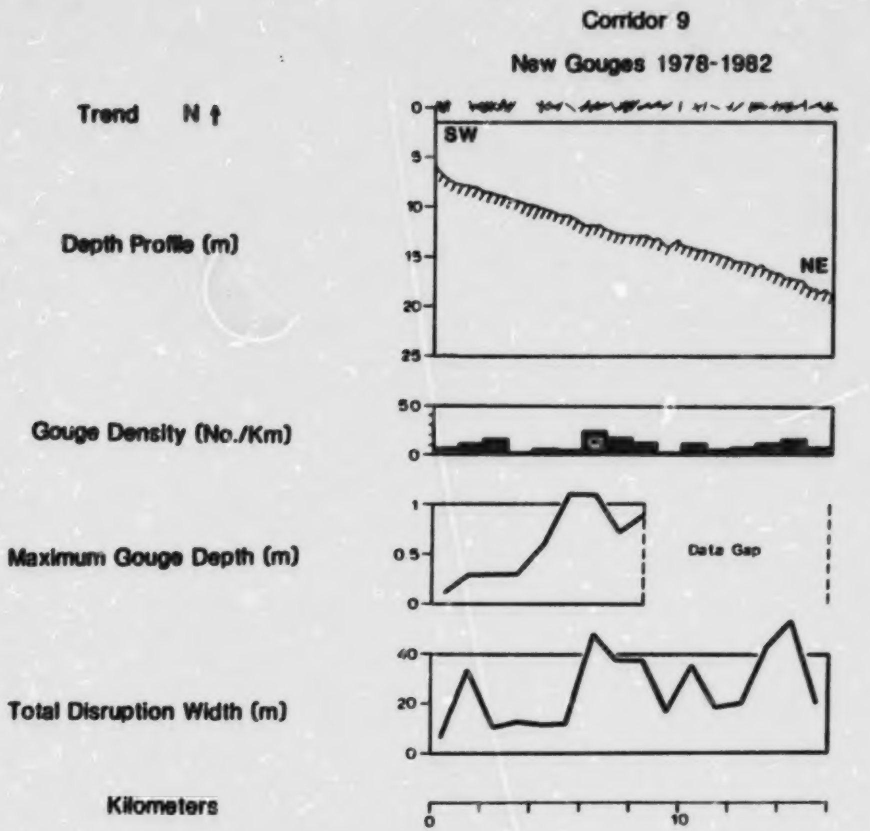

Fig. 3 Graph of dated gouge characteristics and bathymetry profile vs. length of trackline for corridor 9. Vertical exaggeration is 1:400 for figures 3 through 11, except Figure 6. There is a 4 year time span between the compared data sets. See Figure 1 for corridor location.

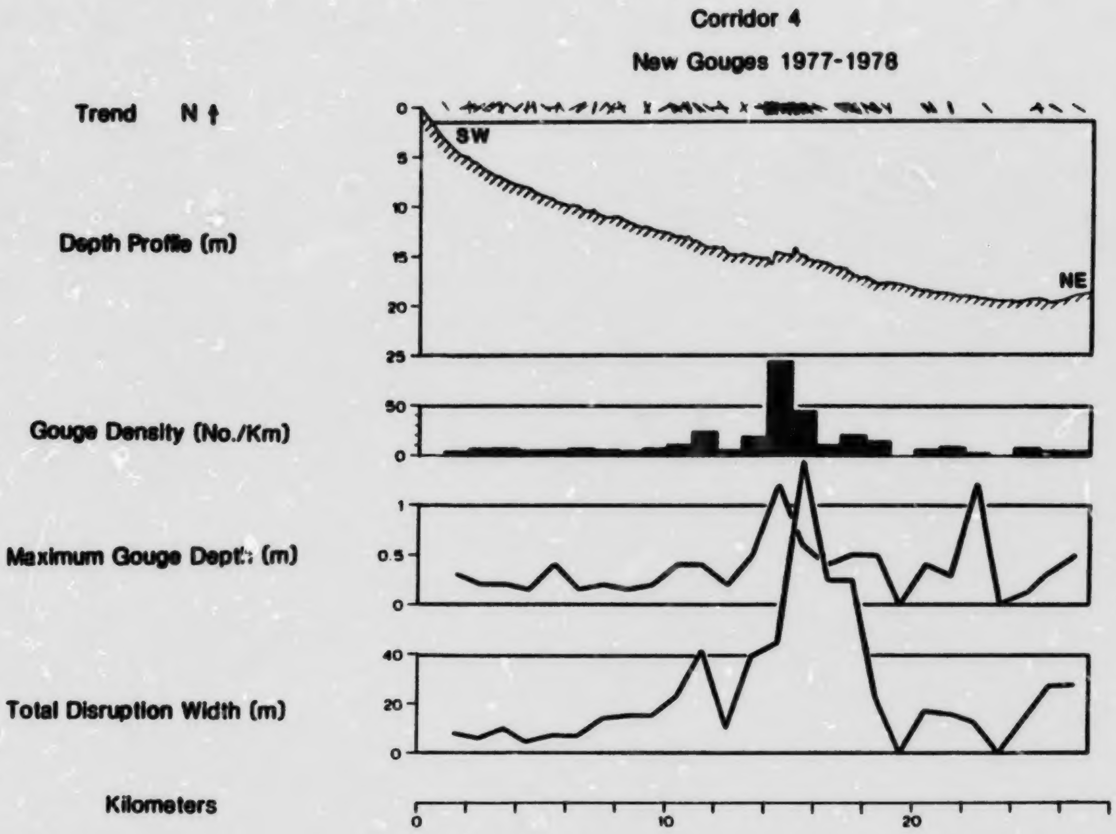

Fig. 4 a. Graph of dated gouge characteristics and bathymetry profile vs. length of trackline for corridor 4 (1 year span between surveys). See Figure 1 for corridor location.

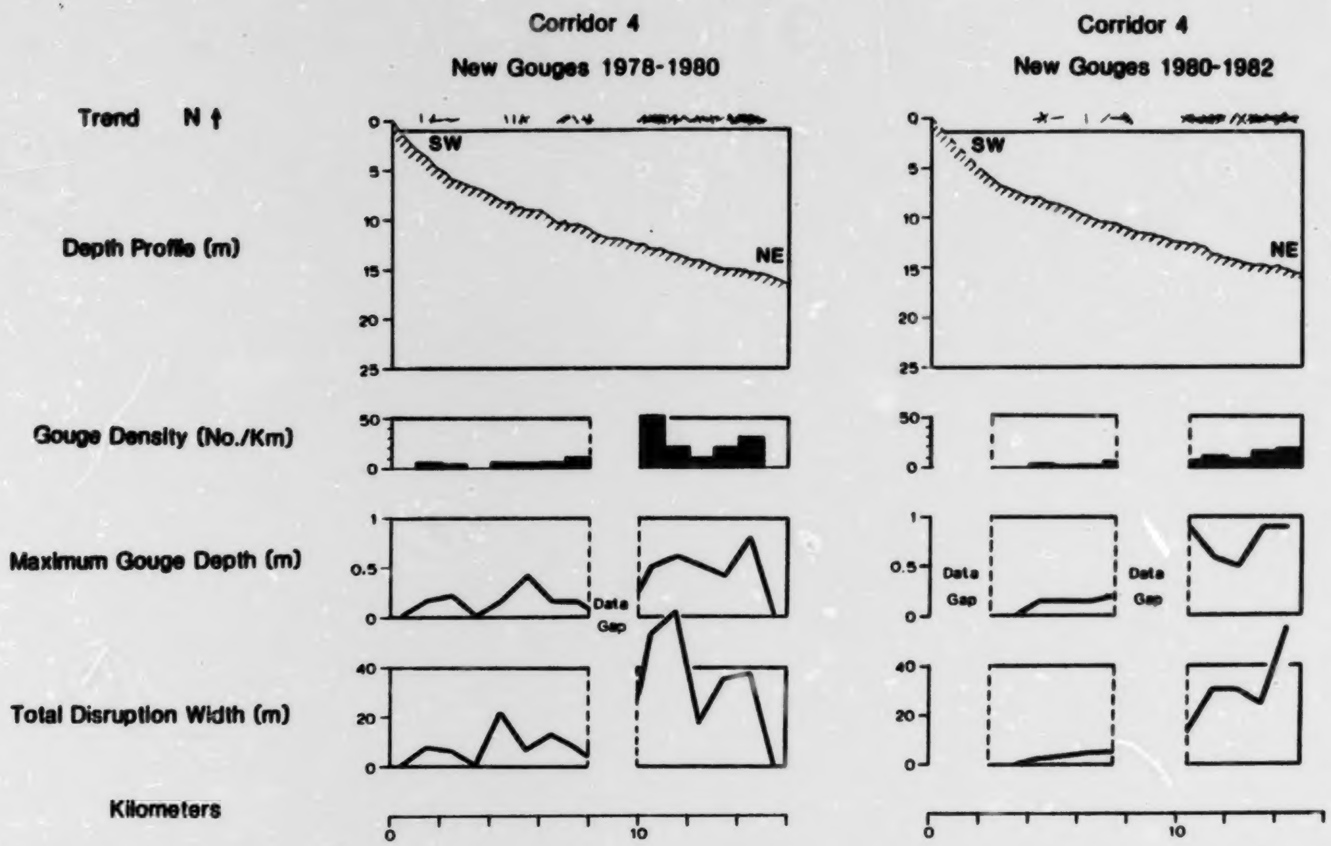

Fig 4 b. Graph of dated gouge characteristics and bathymetry profile vs. length of trackline for corridor 4 (2 year spans between surveys).

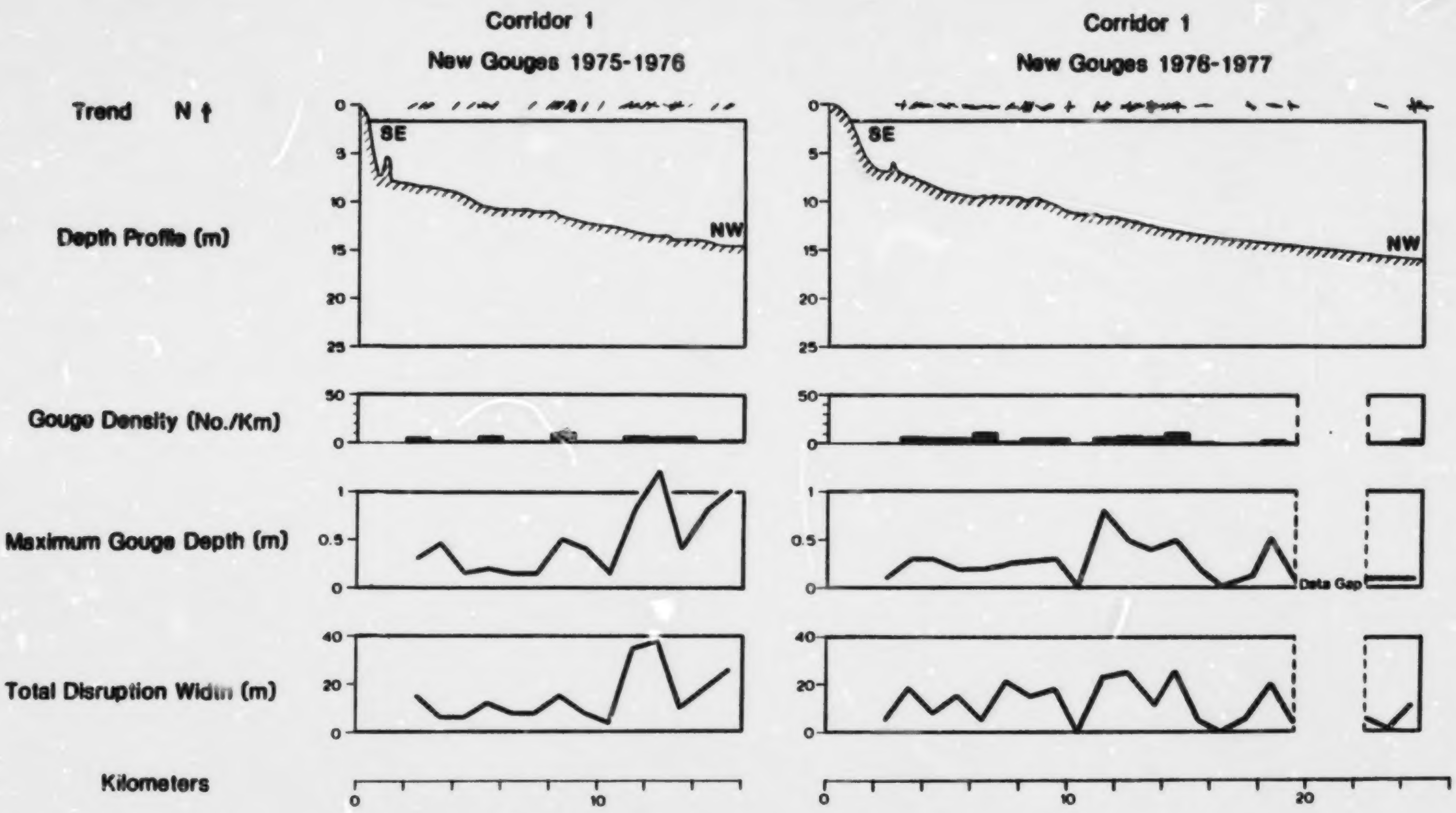

Fig. 5 Graph of dated gouge characteristics and bathymetry profile vs. length of trackline for corridor 1 between 1975 and 1977 (1 year spans between surveys). See USGS Open-File Report #78-730 for data tables for these survey years.

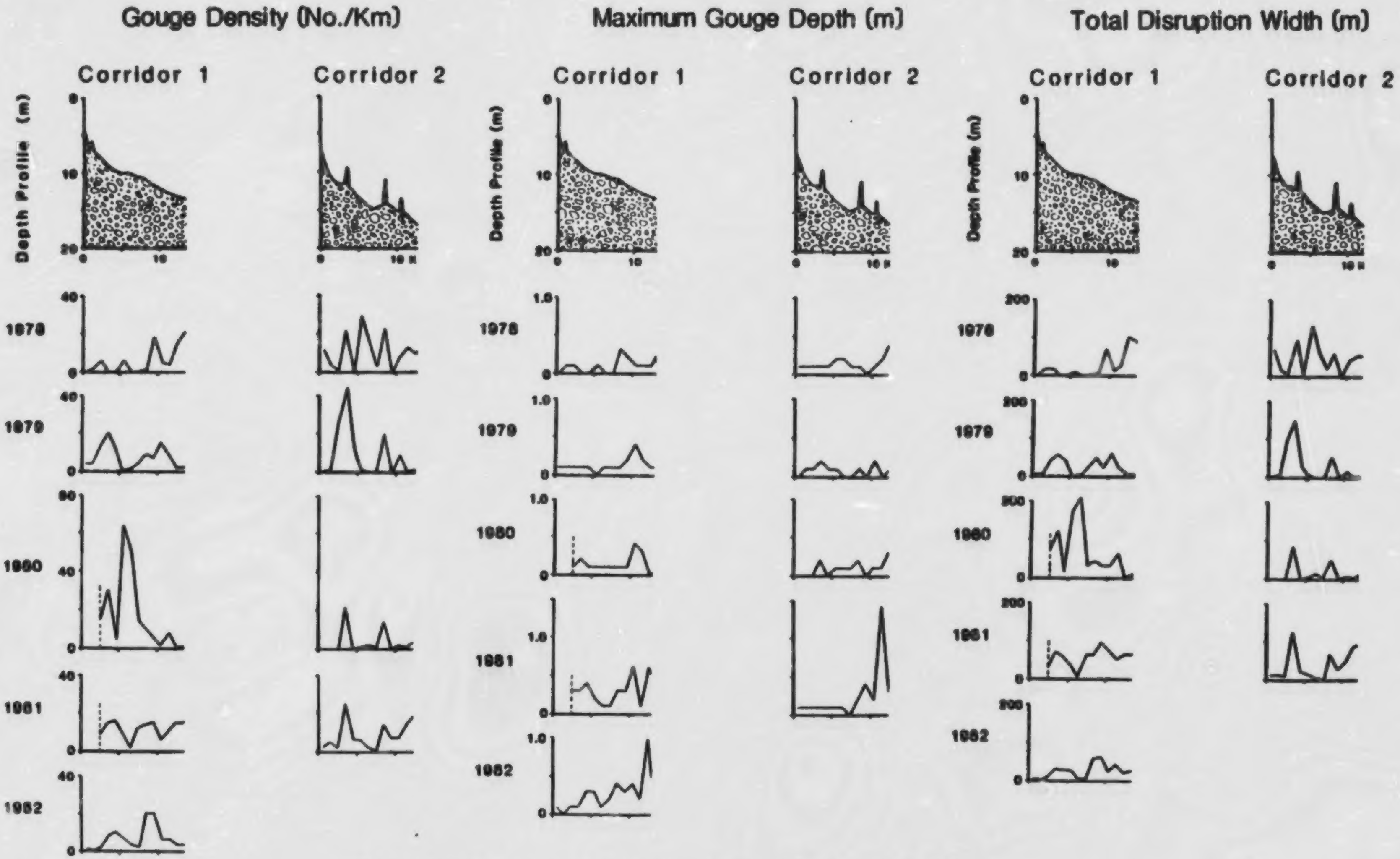

Fig. 6 Graph of dated gouge characteristics and bathymetry profile vs. length for corridors 1 and 2 between 1978 and 1982. (1 year time span between surveys). See Figure 1 for location of corridor. Vertical exaggeration is 1:1000 in this figure.

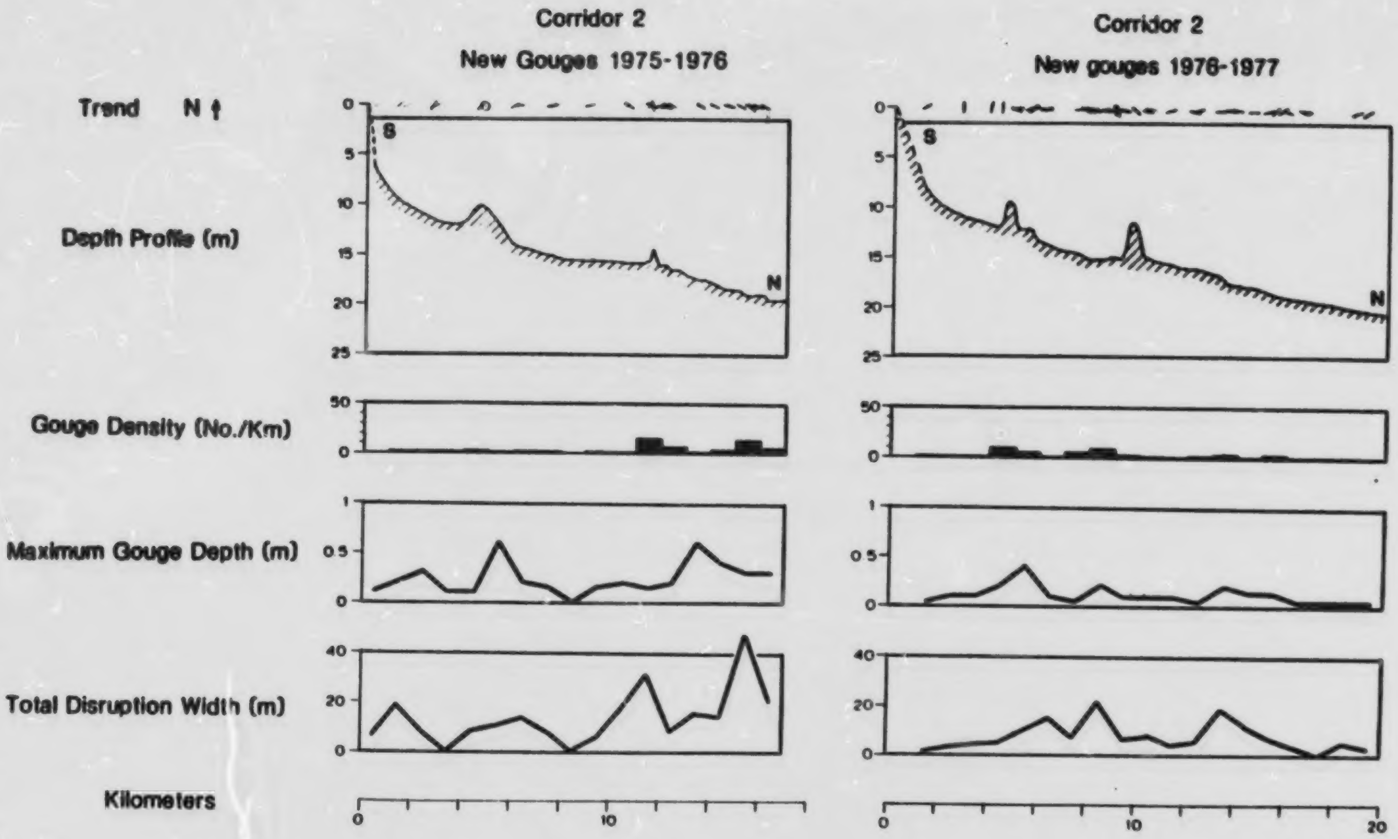

Fig. 7 Graph of dated gouge characteristics and bathymetry profile vs. length of trackline for corridor 2 between 1975 and 1977. (1 year spans between surveys). See Figure 1 for corridor location and USGS Open-File Report #78-730 for data tables for these survey years.

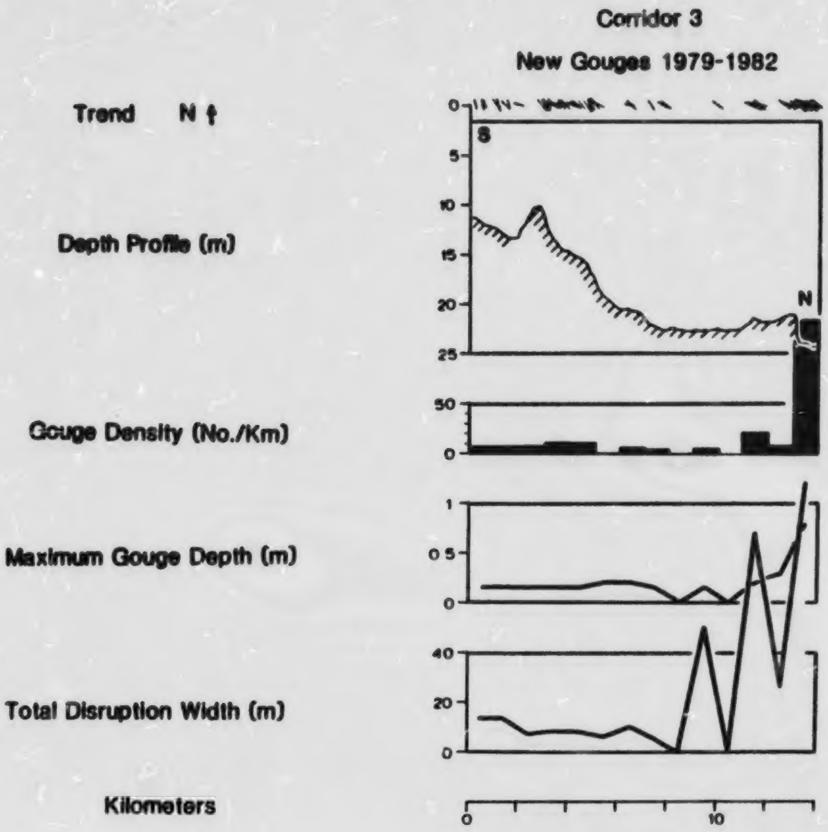

Fig. 8 Graph of dated gouge characteristics and bathymetry profile vs. length of trackline for corridor 3 (3 year spans between surveys). See Figure 1 for corridor location.

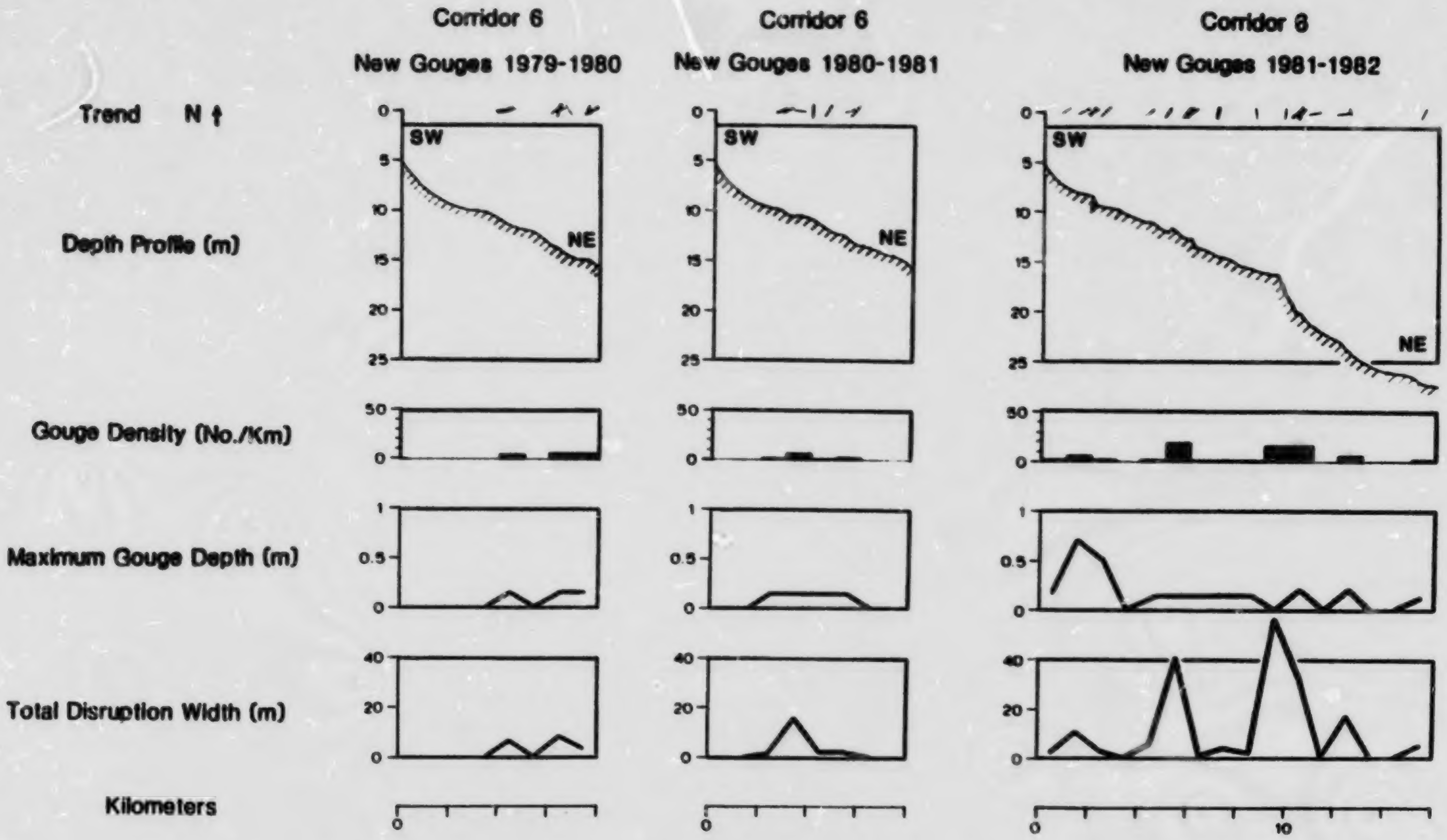

Fig. 9 Graph of new gouge characteristics and bathymetry profile vs. length of trackline for corridor 6 (1 year spans between surveys). See Figure 1 for corridor location.

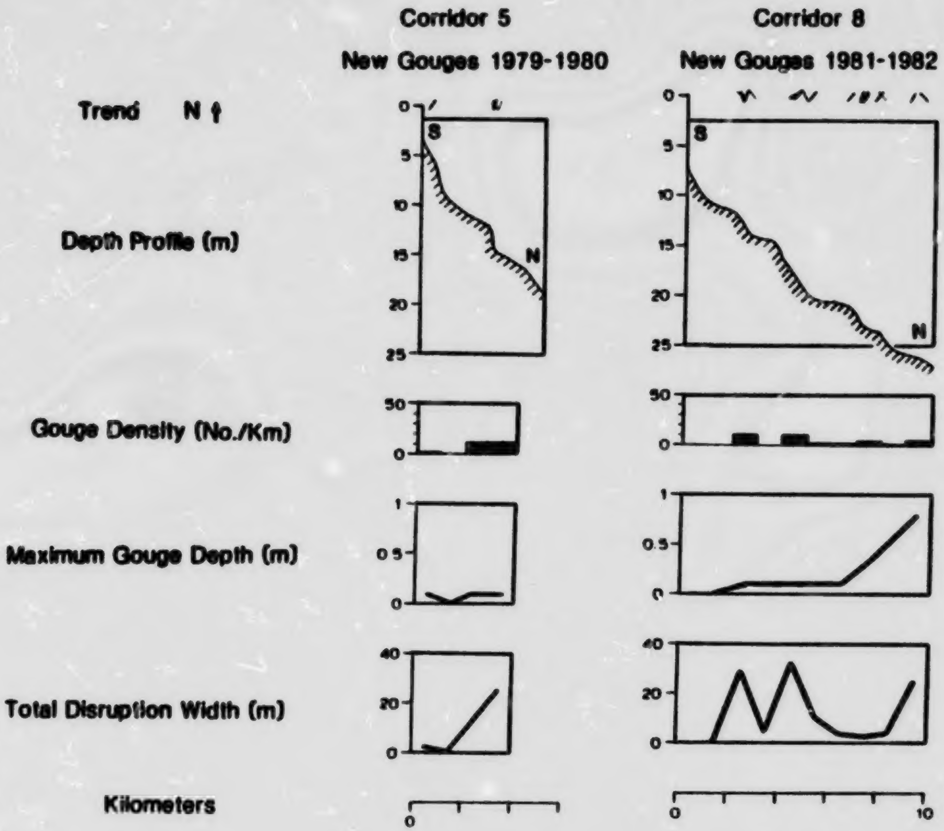

Fig. 10 Graph of new gouge characteristics and bathymetry profile vs. length of trackline for corridors 5 and 8 (1 year spans between surveys). See Figure 1 for corridor location.

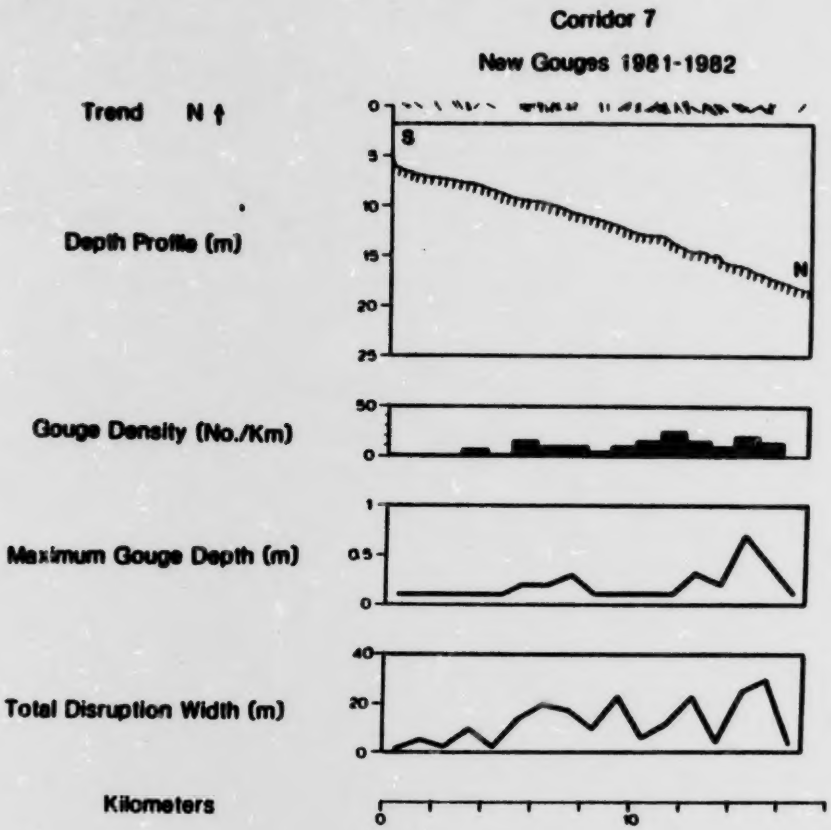

Fig. 11 Graph of new gouge characteristics and bathymetry profile vs. length of trackline for corridor 7 (1 year spans between surveys). See Figure 1 for corridor location.

Corridors 5 and 8 - Corridor 5 was established using navigation stations that ultimately could not be reoccupied and thus we subsequently established corridor 8 nearby using more permanent benchmarks (Figure 1 and Table 2). The bottom profile of these two corridors is steeper in comparison to the those further west and show an irregular profile so that a bench or shoal at 18 to 22m is difficult to discern (Figure 10). Inshore sediments are sands and gravels while at about 20 meters and seaward over consolidated sandy muds and pebbly sandy muds are found.

Corridor 7 - Located in the eastern part of Camden Bay, corridor 7 extends northward from a coast of tundra bluffs (Figure 1). Starting in water depths of about 6m the profile gradually drops to depths of more than 16m (Figure 11) similar to the profiles from Harrison Bay westward (Figure 4). Sediments are sands and muddy sands on the inner part of the line while in water depths of about 18m overconsolidated sandy muds and clays are found.

DATED GOUGES

General Characteristics

The present data set consists of 146 kilometers of corridor. Because many of the corridors have been resurveyed more than twice, 308 one kilometer segments of repetitive observations are compared. The observations consist of over 2500 dated sea bed gouges. These gouges accounted for over 12 km of seabed disruption, to a maximum depth of 1.4 meters. Over 85% of these gouges were less than one year old when entered into the data set.

An "average" dated gouge can be defined using the data. We wish to stress that this gouge is not representative of the undated gouge population because of erosion and infilling of the older gouges. Nor is this average gouge representative of the group of datable gouges that exist in toto on the Beaufort shelf as the data set is limited to the inner shelf inshore of 25m. Barnes and others (1984) have suggested that the highest intensity of gouging occurs within the stamukhi zone in water depths of 30 to 40 meters. Thus, the "average" gouge we describe is representative of the gouges less than a year old inshore of the stamukhi zone. This average gouge occurred in water 14.3m deep and incised the bottom to a depth of 19cm. An average of 8.2 datable gouges occurred per kilometer, disrupting 27m or almost 3% of the seabed. The data set indicate that this 3% is a major portion of the the gouges present on the seafloor in the corridors at any one time. Eighteen percent of the 56 gouges per kilometer in the corridors were less than a year old (Table 4).

Considering a larger gouge population (Barnes and others, 1984) from slightly deeper water (18 m) gives an average gouge density of 70 per kilometer or roughly 9 times the average number of datable gouges. This suggests that on the average something more than 10% of the gouges observed on the inner shelf are less than a few years old.

Gouge depth

The logarithmic distribution of dated gouge frequency versus gouge depth is similar to the distribution shown by the entire gouge population (Barnes and others, (1984). There are very few deep gouges and very many shallow ones (Figure 12). The set of dated multiplet gouge depths are deeper than the population of all dated gouges which is contrary to the suggestion by Barnes and others (1984) that multiplet gouging is associated with first year ice ridges in contact with the seafloor which results in shallow gouge features. Possibly multiplet gouging forms the deeper gouges inshore of the stamukhi zone where our data on gouges is concentrated.

There does not appear to be a relationship between the number of datable gouges and the depth of those gouges. In one case a few gouges were deep (Corridor 9; Figure 3), elsewhere there were many new shallow gouges (Corridors 1,2,& 7; Figures 5,6,7 & 11), while in corridor 4 in 1978 there were many new datable gouges and many of these were deep (Figure 4).

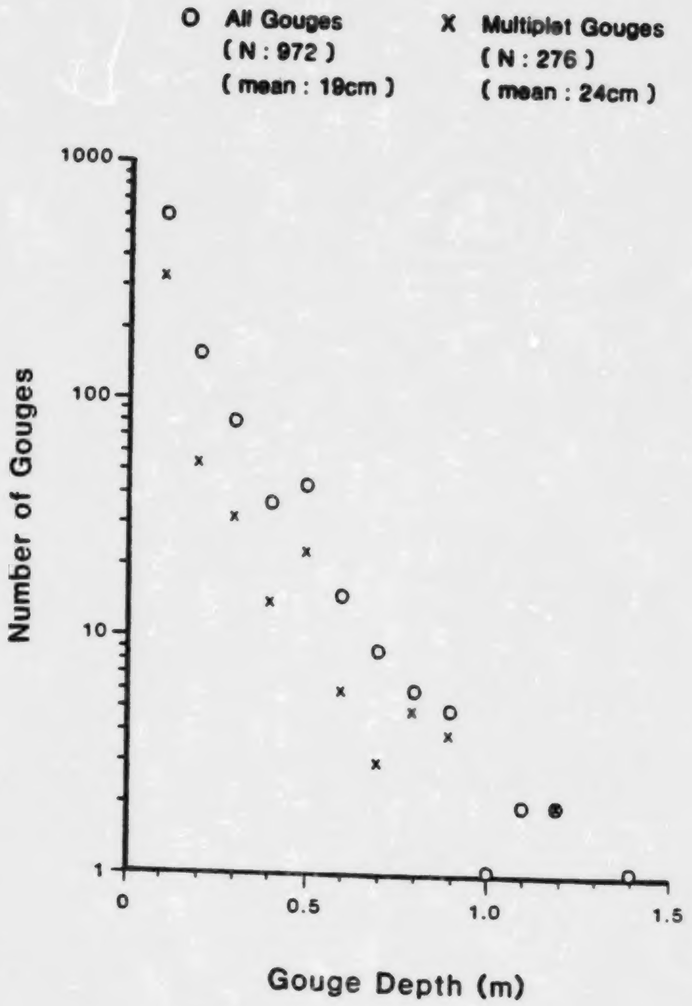

Fig. 12 Distribution of dated gouged versus the observed depth of those gouges. N is the number of gouges in the population.

TABLE 4

Number Of Gouges

Line Number	Water Depth (m)	Average no. Gouges	Seafloor Disruption % per year	Percent of Gouges less than 1 yr. old
1	4-16	64	4.0	22
2	7-17	14	3.4	47
3	11-21	62	2.5	14
4	3-20	81	3.6	10
5 & 8	7-26	76	1.6	11
6	5-26	63	1.1	13
7	6-20	76	3.4	12
9	6-18	13	2.0	18
		56 ave.	2.7 ave.	18 ave.

Age

The data for this study was gathered during the open water season, usually in August. This means that nominally a year passes between successive surveys. We have suggested that most gouging occurs during the winter ice covered period (Barnes and others, 1978, and Barnes and others, 1984). Thus the age of "new" gouges on our records is dependent on the number of winter seasons between successive surveys. In most cases this is 1 year and most of the datable gouges were less than one year old when detected. In a few cases 2,3 and 4 years elapsed between surveys in which case we can only say that the gouging occurred sometime during the 2,3 or 4 years since the last survey.

In addition to the age at time of detection, dated gouges can be assigned to time interval during which they were formed. Thus the gouges that occurred during the winter of 1980-81 can be said to be 4 years old in 1985.

The ratio of the dated gouge population to the total population was computed for each corridor. These data indicate that the dated gouges commonly make up a major percentage of the 32 gouges present on the seafloor, particularly on the inshore segments of the corridors (Table 5). This is best illustrated on corridor 1 where we have the longest dated gouge record (Figure 13). There is also some indication that the decrease is reversed at the inner edge of the stamukhi zone in 20m of water(Corridor 3, in Table 5). We believe this distribution is due to the higher rates of wave and current reworking infilling gouges and obliterating their surface expression (Barnes and Reimnitz, 1978).

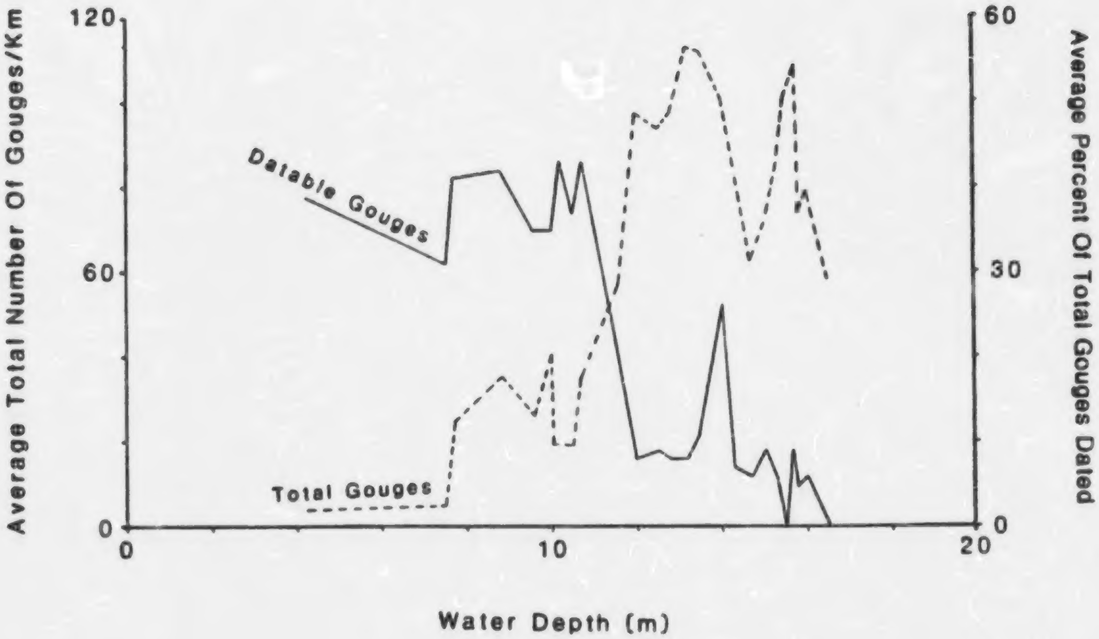

Fig. 13 Comparison of the total gouge population with the percent of that population that was dated (ie. that was generally less than a year old) for corridor 1. Data from Table 5. See Figure 1 for location of corridor 1.

AREAL VARIABILITY

Despite the variability in geographic, sedimentologic, and ice environments of the different corridors, ice gouging occurs ubiquitously in all areas and in all water depths studied. Ice gouging is uniformly distributed inside the 15 meter contour (Figures 3 to 11 and Table 3). Given a random distribution of ice keels in the ice canopy inside the stamukhi zone, a steep rather than gently sloping bottom should be impacted by more ice keels per unit distance. This is not borne out in the overall profiles of the corridors, but is seen where shoals interrupt the profiles (corridor 2, Figure 6 & 7). The steeper profiles of the corridors near Prudhoe Bay (3, 6, 5 and 8 and Figures 8, 9 & 10) do not have noticeable increases in the number of gouges when compared to the more gently sloping corridors to the east and west.

On a smaller scale the concentration and size of newly formed ice gouges is controlled by bottom morphology. Where seafloor slopes are gradual and unbroken by shoals, gouging appears to be evenly distributed in all water depths along the corridors (Corridors 1,7,& 9; Figures 3,5,6, & 11). When shoals occur within the corridor, their abrupt increase in seafloor slope concentrates newly formed gouges on the seaward flanks of these features and partially shelters the inshore areas from gouging (Corridors 2,3,4, & 6; Figures 4,6,7,8 & 9).

Gouge depths and disruption widths of the dated gouges increase slightly in deeper water, although this trend is not clear cut (see corridors 6 and 9; Figures 3 & 9). An increase in disruption widths with increasing water depths is ascribed to the presence and/or development of larger and more massive ice ridges.

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The average disruption per kilometer of corridor for different water depths is a further indicator of the increase in amount of disruption in an offshore direction (Figure 14). These data also show a decrease in the amount of disruption between 17.5 and 22.5m. A similar decrease in this gouge parameter was noted by Barnes and others(1984) at these water depths and was linked to the fact that the inner boundary of the stamukhi zone and an associated step or shoal are located here and serve to protect the seafloor inshore for some distance.

Areas that contain higher numbers of dated, shallow gouges and large disruptions widths are associated with multiplet gouge events (See for example corridor 1, 1978 and 1979, Figure 6; Table 3). As multiplet gouging has been associated with first year ice ridging (Barnes and others, 1984) the areas of high multiplet density should mark areas of frequent first year ridging of sea ice.

At water depths of 15 to 20 meters, almost all of the records show a sharp increase in all parameters - numbers of gouges, disruption widths, and incision depths (See especially corridor 3; Figure 8). The inner edge of the stamukhi zone commonly occurs in these water depths each year (Kovacs, 1976; Reimnitz, and others, 1978). The increase in new gouging in this zone is in keeping with the vastly increased ice ridging that occurs here (Tucker and others, 1979) and confirms our earlier postulations that gouging would be more intense in this zone (Reimnitz and Barnes, 1974; Barnes and others, 1978; and Barnes and others, 1984). In contrast to the data of corridor 3 and Figure 14, corridors 6 and 8 cross the inner edge of the stamukhi zone and do not reflect the increase in gouging we expect in this region. Either gouging in the stamukhi zone is episodic and intense or the boundary does not mark a major change of ice gouge recurrence rates. At present we prefer to believe the former.

TIME VARIABILITY

The year to year variability of the movement and vigor of deep keeled ice ridges should be reflected in the intensity of fresh seafloor gouging. Ice conditions on the inner shelf can vary from season to season due to timing and intensity of storm events and to ice distribution patterns at

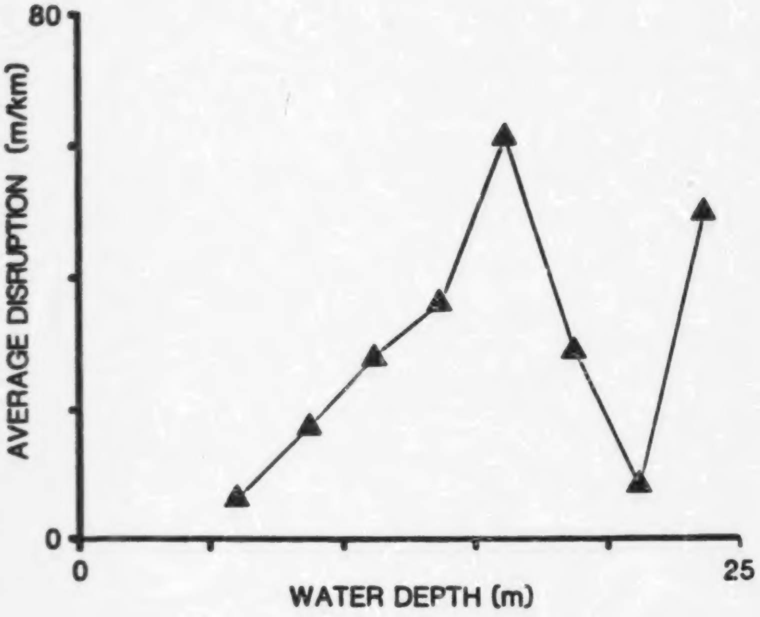

Fig. 14 Commparison of the average amount of seafloor disruption per kilometer and water depth. All corridors were divided into 2.5m depth increments, and the average computed.

36 freeze up. In 1975, at the end of summer, a large percentage of ice from the previous winter remained on the inner shelf which was incorporated in the 1976 ice canopy. These older "welded" ice blocks (Kovacs and Mellor, 1974) would carry solid ice keels within a moving ice canopy and could form a nucleus for grounded ice ridges (Kovacs, 1976). Gouges formed under such an ice canopy could be dominated by individual gouges and by the 2 to 4 keel multiplets from the "welded" keels. Furthermore these gouges should be deeper due to the more competent older ice keels.

In contrast the inner shelf during the summer of 1980 was essentially free of older ice by the time of freeze up and the 1981 ice canopy in the study area was formed primarily from first year ice. As first year ice is dense, keels will be deeper for first year ridges than multiyear ridges with sails of equal height. (Kovacs and Mellor, 1974). However, first year keels would be less competent in their ability to gouge not having undergone extensive welding from successive freeze-thaw cycles, although, they may be responsible for extensive shallow multiplet gouging, commonly with many more than 5 gouges per multiplet (Barnes, and others, 1984). Thus we might expect gouging from the winter of 1980-81 to result in a dominance by shallow multiplet gouges.

The time series data we have to examine is rather limited, consisting of 7 years of records in one corridor and 6 and 2 years of records at only two other corridors (Table 3). The remainder of the data are averaged over several years or represent only a single year. The data indicate no obvious correlation exists between corridors from year to year when comparing trends in average number of dated gouges (Figure 15) or average disruption width (Figure 16). The data do show that the number and width of datable gouges in any year vary by a factor of 5 or more. An attempt to correlate the ice gouge variability with the severity of winter ice conditions by examining the wind record at Barrow has thus far been unsuccessful. The lack of correlation is perhaps due to the short length of record we have in light of the fact that the bottom is only gouged a few percent per year and on the fact that the severity of ice ridging and the seasonality of ridging is poorly known.

CONCLUSIONS

1. The intensity of new gouging is related to water depth and bottom morphology, and indistinctly increases offshore at least to water depths of about 25m. Inshore of the stamukhi zone the amount of gouging and the depth of gouging is rather uniform even into waters less than 10 m deep.
2. No correlation exists between the numbers of new gouges and the depth to which new gouges have penetrated the sea floor. This results because large numbers of new gouge are associated with wide shallow multiplet gouging (first-year pressure ridges)
3. Areas that have high gouge densities and large disruption widths are due to multiplet events. A few large multiplet events may account for extensive but shallow disruption of the seafloor.
4. Annual variations in the number of individual verses multiplet gouges may be related to the presence or absence of multi-year ice ridges on the inner shelf during winter.
5. The annual variations in the data indicate that year to year gouging on this part of the Beaufort shelf is ubiquitous. The year to year intensity of gouging can vary by a factor of 5.

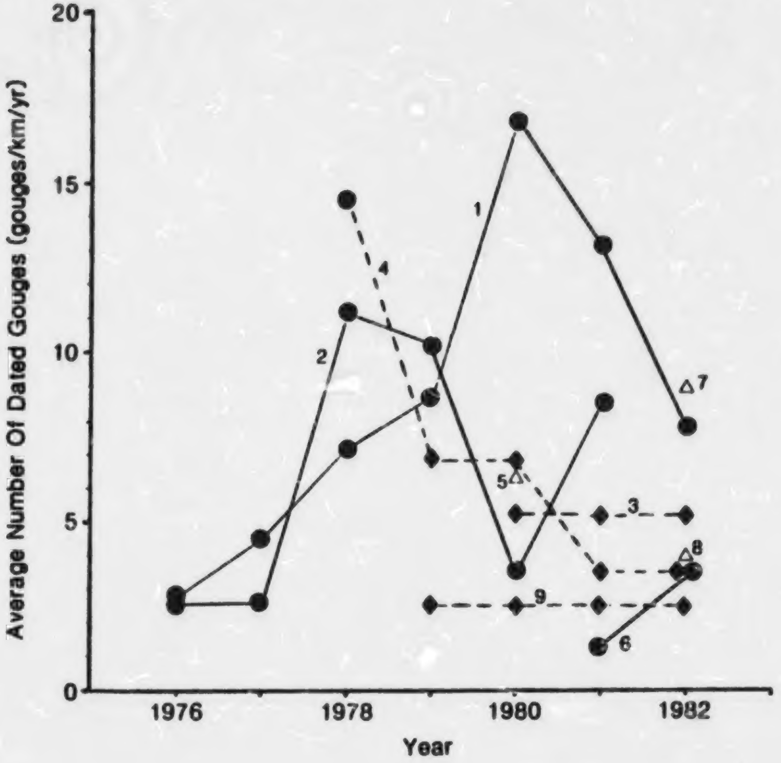

Fig. 15 The yearly variation in the average number of dated gouges per kilometer observed in each of the corridors.

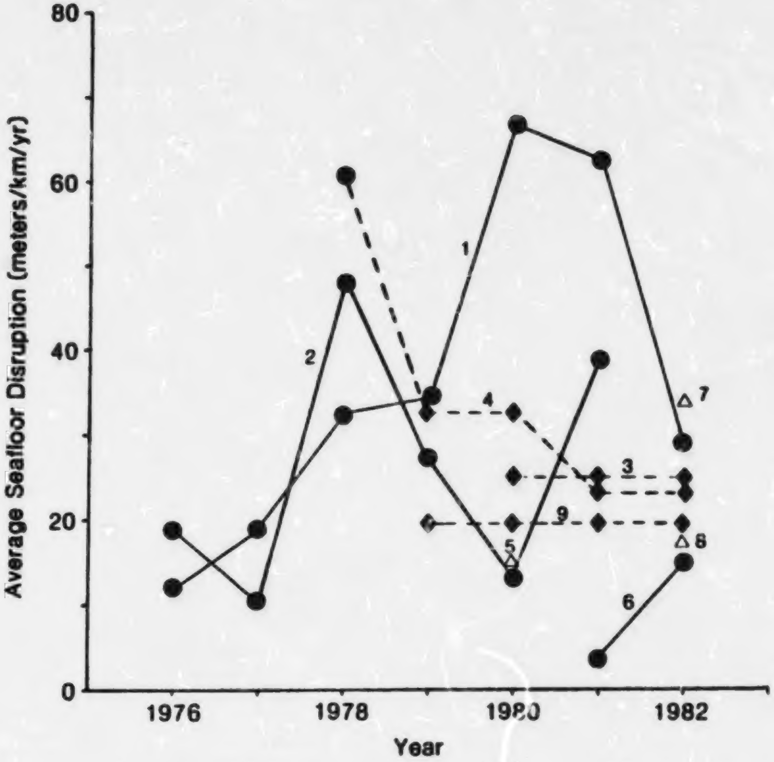

Fig. 16 The yearly variation in the average disruption width per kilometer observed in each of the corridors.

REFERENCES

Barnes, P.W., and Asbury, J., 1985, Detailed morphology of the seafloor at the inner edge of the stamukhi zone, Beaufort Sea, Alaska; proceeding Arctic Workshop, Dept. of Energy, Morgantown Energy Technology Center Morgantown, West Virginia.

Barnes, P.W., McDowell, D.M., and Reimnitz, Erk, 1978, Ice gouging characteristics: their changing patterns from 1975-1977, Beaufort Sea, Alaska: U.S. Geological Survey Open-File Report 78-730, 42 p.

Barnes, P.W., Rearic, D.M. and Reimnitz, Erk, 1984, Ice gouge characteristics and processes: in Barnes, P.W., Schell, D.M. and Reimnitz, Erk, (eds.), The Alaskan Beaufort Sea - Ecosystem and Environment, Academic Press, New York, p. 159-184.

Barnes, P.W., and Reimnitz, Erk, 1974, Sedimentary processes on arctic shelves off the northern coast of Alaska, in, Reed, J.C. and Sater, J.E. eds, The Coast and Shelf of the Beaufort Sea, The Arctic Institute of North America, Arlington, VA, p. 439-476.

Barnes, P.W., and Reimnitz, Erk, 1979, Ice gouge obliteration and sediment redistribution event; 1977-1978, Beaufort Sea, Alaska: U.S. Geological Survey Open-File Report 79-848, 22 p.

Bea, R.G., Puskar, F.J., Barnes, P.W., and Reimnitz, Erk, 1985, The role of ice gouging in determining global forces on arctic structures: Proceedings, Ameri- can Society of Civil Engineers, Arctic '85, p. 251-266.

Belderson, R.H., Kenyon, N.H. Stride, A.H. and Stubbs, A.R., 1972, Sonographs of the seafloor; A picture atlas, Elsevier Publishing, Co., New York, 185p.

Kovacs, A., 1976, Grounded ice in the fast ice zone along the Beaufort Sea coast of Alaska. US Army Cold Regions Research and Engineering Laboratory, CRREL Report 76-32, 21p.

Kovacs, A. and Mellor, M., 1974, Sea ice morphology and ice as a geologica agent in the southern Beaufort Sea, in: Reed, J.C., and Sater, J.E., (eds.), The Coast and Shelf of the Beaufort Sea, Arctic Institute of North America, Arlington, Virginia, p. 1132-161.

Lewis, C.F.M. 1977, The frequency and magnitude of drift ice groundings from ice-scour tracks in the Canadian Beaufort sea, in: Proceedings, Fourth International Conference on Port and Ocean Engineering under Arctic Conditions, 1977, Muggeridge, D.B., (ed.), Memorial University, St. Johns Newfoundland, v. 1, p. 568-576.

Reimnitz, Erk, and Barnes, P.W., 1974, Sea ice as a geologic agent on the Beaufort Sea shelf of Alaska, in, Reed, J.C., and Sater, J.E., eds., The Coast and Shelf of the Beaufort Sea, The Arctic Institute of North America, Arlington, Virginia p. 301-351.

Reimnitz, Erk, Barnes, P.W., Toimil, L.J. and Melchior J., 1977, Ice gouge recurrence and rates of sediment reworking, Beaufort Sea, Alaska: Geology v. 5, p. 405-408.

Reimnitz, Erk,. Kempema, E.W., Ross, C.R. and Minkler, P.W., 1980, Overconsolidated Surficial deposits on the Beaufort Sea Shelf: U. S. Geological Survey Open-File Report No. 80-2010, 38 p.

Reimnitz, Erk, Toimil, L.J., and Barnes, P.W., 1978, Arctic continental shelf morphology related to sea-ice zonation, Beaufort Sea, Alaska; Marine Geology, v.28, p 179-210.

Thomas, D.R., and Pritchard, R.S., 1980, Beaufort Sea ice mechanical energy budget, 1975-76, Flow Research Report No. 165, Flow Industries Kent, Washington, 37p.

Toimil, L.J., 1978, Ice-gouged microrelief on the floor of the eastern Chukchi Sea, Alaska; a reconnaissance survey, U.S. Geological Survey, Open File Report number 78-693, 48p. plus Appendix.

Tucker, W.B., W.F. Weeks, and M.D. Frank, 1979, Sea ice ridging over the Alaskan Continental shelf, Jour. Geophys. Res. v. 84, p. 4885-4897.

Weeks, W.F., Barnes, P.W., Rearic, D.M. and Reimnitz, Erk, 1984, Some probabilistic aspects of ice gouging on the Alaska Shelf of the Beaufort Sea, in Barnes, P.W., Schell, D.M. and Reimnitz, Erk (eds.), The Alaskan Beaufort Sea - Ecosystem and Environment, Academic Press, New York, p. 213-236.

Weeks, W.F., Tucker, W,B. III, Frank, M., and Fungchoroen, S., 1980, Characterization of surface roughness and floe geometry of sea ice over the continental shelfs of the Chukchi and Beaufort Seas, in, R.S. Pritchard, ed., Sea Ice Processes and Models, U. of

Washington Press, Seattle, Washington, p 300-312.

Wolf, S., Barnes, P.W., and Reimnitz, E., 1983, Analysis of hummocky subbottom from repetitive observations north of Tigvariak Island, Beaufort Sea, Alaska; in Annual Reports of Principal Investigator to NOAA's Outer Continental Shelf Environmental Assessment Program: NOAA Juneau, Alaska, 8 pages.

APPENDIX

ICE GOUGE DATA SHEETS

KEY TO APPENDIX

Testline - refers to corridor number to which the data apply

Julian Date, Year - Year and date of survey

Template Identification - Template used to correct orientation distortion cause by variable ship speed and recorder paper speeds - expressed as the ratio of the along track distance to the slant range distance.

Trackline Number - Field number used to organize field data within each years field effort - not used in analysis.

Additional explanation and usage of many of the following terms is given in Barnes and others, (1984) and in Figure A1 taken from that reference.

Single Gouges - Gouges generated by a single tool indenting the bottom leaving a single furrow.

Multiple gouges - Gouges generated by a tool with 2 or more indenters leaving one or more adjoining furrows on the seafloor.

Segment - Corridors were divided into 1 kilometer segments starting at A, thus the first segment is AB with a starting point at 0km (AB/0). Further along the corridor segment DE starts at 3km (DE/3). Within a segment the distance from the inshore end of the corridor to the occurrence of a dated gouge is given in hundreths of a kilometer (eg. within segment BC/1 a dated gouge was located at 1.50km from A).

Water Depth - Water depth at the inner end of a segment at at the location of each dated gouge.

Total Gouges - Total number of seafloor furrows observed in a segment. Each furrow in a multiple gouge is counted separately.

Total New Gouges - Total number of dated seafloor gouges in a segment. Each furrow in a dated multiple gouge is counted separately.

Length of new single gouges - Total length in meters of the dated gouges as observed on the sonographs. NL - gouge traversed the entire sonograph and the length was not ascertained: usually a gouge length greater than 250m is indicated based on the scan width of the sonographs.

Gouge depth - The distance in meters from the "average" seafloor to the bottom of a gouge as measured on the fathograms. This depth is entered as <.2m when the gouge was not resolvable on the fathogram.

Gouge width - The distance in meters across the width of a gouge at the measured at the level of the "averaged" seafloor measured on the fathogram.

Ridge height - The distance in meters from the "average" seafloor to the top of the highest ridge flanking a dated gouge. This height is assumed to be <.2m when the ridge is not resolvable on the fathogram.

Φ (° T)- refers to the uncorrected and corrected orientations of the dated gouges relative to true north. The orientations are uniformly reported entered as an angle between 0 and 180° and should not be read as the direction of ice motion during gouging. 160/105 is a gouge oriented at 160° to the right of a ships course of 305° which results in a 105° orientation for the gouge relative to true north.

Length of new Multi. gouges - See Length of single gouges above.

Number of incisions - Refers to the number of parallel adjoining furrows that comprise a multiple gouge feature.

Deepest incision - The distance in meters from the "average" seafloor to the bottom of the deepest furrow in each multiple gouge as measured from the fathograms.

Disruption Width - The distance im meters measured at right angle to a multiple gouge from one bounding ridge to the other. ie the total width of seafloor disrupted by a multiple gouge.

Φ (° T) - Refers to the orientation of the multiple gouges. See this same entry above.

Comments - Includes additional observations on sonographs and fathograms. Note - CS= Ships course, SS# - Side scan sonar roll numbers, Bats# - Fathogram roll number, Termination direction - direction of implied ice motion determined from the termination of an ice gouge and could have an orientation from 0 to 360° .

TESTLINE: 1	**JULIAN DATE:** 238	**YEAR:** 1977-1978	**TEMPLATE IDENTIFICATION:** 1:1,860	

TRACKLINE NUMBER: 14,19

SEGMENT	WATER DEPTH (M)	TOTAL GOUGES	TOTAL NEW GOUGES	%	Length SINGLE GOUGES: NEW SINGLE GOUGES	GOUGE DEPTH (M)	GOUGE WIDTH (M)	RIDGE HEIGHT (M)	Ø (°T)	Length MULTIPLE GOUGES: NEW MULTI. GOUGES	NUMBER OF INCIS.	DEEPEST INCISION (M)	DISRUPT WIDTH (M)	Ø (°T)	COMMENTS CS = 305 °T
AB/0	4.2	0	0	0											
															SS # 5 Pats# 8,10
BC/1	7.5	8	2	25.0											Beginning of trackline.
1.50	7.8									73	2	NOT CROSSED	18	110/55	totally reworked (hydrolic).
															3m shoal at pt. B.
CD/2	7.7	8	6	75.0											Termination at 1.5 direction - 235°T
2.30	8.0									NL	2	<.2	5	145/90	
2.80	8.5									NL	4	<.2	15	140/85	
DE/3	8.8	2	0	0											Sed. ripples (New)
EF/4	9.6	8	0	0											Sed. ripples (New)
FG/5	10.0	8	6.	75.0											Sed. ripples (heavy concentration)
5.40	10.0				175	<.2	1	<.2	160/105						orien. = 100°T λ = 2 m
5.65	10.0				63	<.2	2	<.2	160/105						
5.85	9.9				41	<.2	1	<.2	35/160						termination direction - 160°T
5.85	9.9				35	<.2	1	<.2	35/160						termination direction - 160°T
5.85	10.1				32	<.2	1	<.2	35/160						termination direction - 160°T
5.99	10.0				127	<.2	1	<.2	170/115						
GH/6	10.0	3	0	0											reworked bottom - smoothed (hydrolic) Sed. waves (few)
HI/7	10.5	5	0	0											sed. waves - many orien = 175°T λ = ~100m
IJ/8	10.7	17	1	5.9											
8.60	11.5				NL	.3	3	<.2	25/150						gouge terminates with hooked end upslope
															direction - 150°T

TESTLINE: 1	JULIAN DATE: 238	YEAR: 1977-1978	TEMPLATE IDENTIFICATION: 1:1.860

TRACKLINE NUMBER: 14, 19

					Length SINGLE GOUGES					Length MULTIPLE GOUGES					
SEGMENT	WATER DEPTH (M)	TOTAL GOUGES	TOTAL NEW GOUGES	%	NEW SINGLE GOUGES	GOUGE DEPTH (M)	GOUGE WIDTH (M)	RIDGE HEIGHT (M)	Ø (°T)	NEW MULTI. GOUGES	NUMBER OF INCIS.	DEEPEST INCISION (M)	DISRUPT WIDTH (M)	Ø (°T)	COMMENTS CS = 305°T
JK/9	11.5	75	18	24.0											on all segments gouges
9.25	11.6									NL	3	NC	17	155/100	have been smoothed
9.25	11.6									NL	3	NC	11	155/100	by hydrolic reworking.
9.35	11.7				NL	.2	3	<.2	130/75						
9.40	11.7									NL	2	.2	14	130/75	
9.65	11.9				280	<.2	2	<.2	00/125						
9.85	11.9									105	4	<.2	13	20/145	
9.99	12.0									831	4	NC	9	05/130	continues to next segment.
KL/10	12.0	76	5	6.6											
10.25	12.1									same as above	4	NC	9	05/130	
10.55	12.3				25	<.2	2	<.2	60/05						
LM/11	12.5	91	4	4.3											
11.30	12.6				50	<.2	7	<.2	120/65						START Trackline 19
11.60	12.7				108	NC	3	NC	170/115						terminates upslope with hooked end 115°T
11.80	12.8				138	<.2	11	<.2	160/105						
11.80	12.8				NL	<.2	2	<.2	160/105						terminates direction - 315°T
MN/12	12.8	94	15	16.0											
12.30	13.0				NL	<.2	2	<.2	170/115						
12.45	13.0									NL	4	<.2	23	55/00	
12.45	13.0				117	<.2	5	<.2	55/00						
12.45	13.0									NL	7	NC	65	55/00	
12.65	13.0				163	NC	2	NC	175/120						
12.75	13.0				43	NC	2	NC	05/130						

TESTLINE: 1

JULIAN DATE: 241

YEAR: 1977-1978

TEMPLATE IDENTIFICATION: 1:1.860

TRACKLINE NUMBER: 14,19

					Length SINGLE GOUGES					Length MULTIPLE GOUGES					
SEGMENT	WATER DEPTH (M)	TOTAL GOUGES	TOTAL NEW GOUGES	%	NEW SINGLE GOUGES	GOUGE DEPTH (M)	GOUGE WIDTH (M)	RIDGE HEIGHT (M)	Ø (°T)	NEW MULTI. GOUGES	NUMBER OF INCIS.	DEEPEST INCISION (M)	DISRUPT WIDTH (M)	Ø (°T)	COMMENTS
NO/13	13.2	141	21	14.9											
13.01	13.2									NL	4	<.2	14	00/125	
13.60	13.4									NL	5	NC	40	170/115	terminates direction - 125°T
13.60	13.4									NL	2	.3	13	140/85	
13.70	13.4				NL	<.2	3	.4	160/105						
13.90	13.5									NL	9	.2	21	160/105	continues to next segment.
OP/14	13.5	137	18	13.1											
14. 10	13.8				35	<.2	2	<.2	130/75						
14. 15	13.8									NL	9	.2	21	160/105	
14. 25	13.5									NL	3	<.2	8	155/100	
14. 50	13.9									NL	4	<.2	12	155/100	
14. 80	13.8				NL	NC	2	NC	05/130						
PQ/15	14.0	61	8	13.1											seafloor smoothed from reworking. North of line.
15.80	14.3									NL	8	.3	60	154/99	
QR/16	14.3	71	4	5.6											Reworked seafloor. North of line.
16.05	14.3									NL	2	.2	20	151/96	
16.65	14.5									NL	2	.5	17	144/89	
RS/17	14.7	69	0	0.0											Reworked seafloor. North of line.
ST/18	15.0	64	0	0.0											Reworked seafloor. many older gouges infilled and gone.
TU/19	15.3	102	0	0.0											Reworked seafloor. NORTH OF LINE.

TESTLINE: 1 | JULIAN DATE: 241 | YEAR: 1977-1978 | TEMPLATE IDENTIFICATION: 1:1,860

TRACKLINE NUMBER: 14, 19					Length SINGLE GOUGES					Length MULTIPLE GOUGES					CS: 305°T
SEGMENT	WATER DEPTH (M)	TOTAL GOUGES	TOTAL NEW GOUGES	%	NEW SINGLE GOUGES	GOUGE DEPTH (M)	GOUGE WIDTH (M)	RIDGE HEIGHT (M)	Ø (°T)	NEW MULTI. GOUGES	NUMBER OF INCIS.	DEEPEST INCISION (M)	DISRUPT WIDTH (M)	Ø (°T)	COMMENTS
UV/20	15.5	118	0	0.0											Reworked seafloor.
VW/21	15.7	108	10	9.3											
21.30	15.6									NL	5	.4	21	149/94	
21.50	15.6									NL	5	.5	28	164/109	
WX/22	15.8	81	4	4.9											
22.40	15.9				NL	<.2	2	<.2	06/131						
22.99	16.0									NL	3	.3	21	152/97	Continues into next segment.
XY/23	16.0	79	5	6.3											
23.01	16.0									NL	3	.3	21	152/97	
23.55	16.0				NL	<.2	2	<.2	162/107						
23.55	16.0				NL	.3	18	.3	124/69						Termination: 249°T
YZ/24	16.5	58	0	0.0											
Z/end	16.7														

TESTLINE: 1 **JULIAN DATE:** 220 **YEAR:** 1978-1979 **TEMPLATE IDENTIFICATION:** 1:1.860

TRACKLINE NUMBER: 13

					LENGTH SINGLE GOUGES					LENGTH MULTIPLE GOUGES					
SEGMENT	WATER DEPTH (M)	TOTAL GOUGES	TOTAL NEW GOUGES	%	NEW SINGLE GOUGES	GOUGE DEPTH (M)	GOUGE WIDTH (M)	RIDGE HEIGHT (M)	Ø (°T)	NEW MULTI. GOUGES	NUMBER OF INCIS.	DEEPEST INCISION (M)	DISRUPT WIDTH (M)	Ø (°T)	COMMENTS CS = 304 °T
AB/0	4.7	8	4	50.0											
0.30	5.1									92	2	<.2	5	00/124	SSS# 8 Beds# 9
0.30	5.1				24	<.2	1	<.2	32/156						
0.30	5.1				21	<.2	1	<.2	157/101						
BC/1	5.7	6	4	66.7											Shoal height = 1.9m at Pt. B
1.75	6.9				52	<.2	1	<.2	11/135						
1.75	6.9				50	<.2	1	<.2	176/120						Terminates direction - 120°T
1.75	6.9				125	<.2	1	<.2	170/114						
1.90	7.5				165	<.2	3	<.2	06/130						
CD/2	8.2	28	13	46.4											
2.05	8.2				42	<.2	2	<.2	20/144						
2.30	7.8				37	<.2	2	<.2	00/124						
2.65	8.2				45	<.2	2	<.2	140/84						
2.60	8.0				20	<.2	1	<.2	140/84						
2.60	8.0				27	<.2	2	<.2	170/114						
2.75	7.9									NL	5	<.2	18	10/134	
2.85	8.1									NL	3	<.2	13	162/106	
DE/3	8.2	20	20	100.0											gouge ∥ to TL
3.30	8.5									NL	5	<.2	12	10/134	and runs length of seg.
3.50	9.0									NL	15	<.2	47	175/119	continues into next segment.
EF/4	9.3	15	12	80.0											
4.15	9.4									NL	12	<.2	45	175/119	
FG/5	10.0	3	0	0											

TESTLINE: 1 **JULIAN DATE:** 220 **YEAR:** 1978-1979 **TEMPLATE IDENTIFICATION:** 1:1.860

TRACKLINE NUMBER: 13

					Length SINGLE GOUGES					Length MULTIPLE GOUGES					
SEGMENT	WATER DEPTH (M)	TOTAL GOUGES	TOTAL NEW GOUGES	%	NEW SINGLE GOUGES	GOUGE DEPTH (M)	GOUGE WIDTH (M)	RIDGE HEIGHT (M)	ø (°T)	NEW MULTI. GOUGES	NUMBER OF INCIS.	DEEPEST INCISION (M)	DISRUPT WIDTH (M)	ø (°T)	COMMENTS
GH/6	9.8	1	1	100.0											
6.1	10.0				NL	<.2	2	<.2	150/94						
HI/7	10.1	5	4	80.0											
7.70	10.2				35	<.2	3	<.2	28/152						
7.80	10.8									NL	2	<.2	19	158/102	Continues into next segment
7.85	10.5				22	<.2	2	<.2	135/79						sediment waves
IJ/8	10.6	11	9	81.8											
8.01	10.6				30	<.2	2	<.2	158/102						
8.01	10.6									NL	2	<.2	13	158/102	
8.25	11.0				NL	<.2	2	<.2	158/102						Terminates direction - 102°T
8.40	11.1									221	3	<.2	20	157/101	
8.80	11.2									46	2	<.2	12	132/76	
JK/9	11.2	34	6	20.6											
9.05	11.3				NL	.2	8	<.2	132/76						
9.05	11.3				123	<.2	1	<.2	152/96						
9.15	11.4				NL	<.2	3	<.2	140/84						
9.15	11.4				NL	<.2	2	<.2	140/84						
9.80	11.7				NL	<.2	2	<.2	126/70						
9.95	11.7				NL	<.2	3	<.2	11/135						
KL/10	11.8	86	15	17.4											
10.30	11.9				NL	.4	7	.7	92/36						
10.40	12.0				NL	<.2	2	<.2	155/99						
10.60	12.0									375	4	<.2	20	00/124	
10.70	12.0				NL	NC	3	NC	148/92						

TESTLINE: 1 **JULIAN DATE:** 220 **YEAR:** 1978-1979 3

TRACKLINE NUMBER: 73 **TEMPLATE IDENTIFICATION:** 1:1.860

					Length SINGLE GOUGES					Length MULTIPLE GOUGES					
SEGMENT	WATER DEPTH (M)	TOTAL GOUGES	TOTAL NEW GOUGES	%	NEW SINGLE GOUGES	GOUGE DEPTH (M)	GOUGE WIDTH (M)	RIDGE HEIGHT (M)	Ø (°T)	NEW MULTI. GOUGES	NUMBER OF INCIS.	DEEPEST INCISION (M)	DISRUPT WIDTH (M)	Ø (°T)	COMMENTS
10.75	12.0				NL	NC	2	NC	148/92						
10.75	12.0				62	<.2	2	<.2	114/58						
10.80	11.8				NL	NC	5	NC	05/129						
10.90	12.3				NL	<.2	2	<.2	140/84						
10.90	12.3				NL	<.2	2	<.2	140/84						
10.90	12.3				NL	<.2	2	<.2	140/84						
10.95	12.2				NL	<.2	2	<.2	142/86						
10.95	12.2				NL	.2	3	<.2	148/92						
															continues into next segment
LM/11	12.2	51	9	17.6											
11.15	12.3				NL	.2	3	<.2	148/92						
11.15	12.3				72	NC	3	NC	140/84						
11.20	12.3				58	<.2	2	<.2	144/88						
11.75	12.4				130	<.2	1	<.2	161/105						
11.80	12.4				150	NC	2	NC	03/127						
11.90	12.5				105	<.2	2	<.2	167/111						Terminates direction - 127°T
11.90	12.5				127	<.2	2	<.2	167/111						
11.90	12.5				190	NC	2	NC	00/124						
11.95	12.6				117	<.2	3	<.2	131/75						Terminates - direction - 124°T
MN/12	12.7	51	2	3.9											
12.20	12.9				75	NC	3	NC	143/87						START Trackline 33 SSS#12 BATS#106
12.25	12.9				30	<.2	2	<.2	162/106						JD 227
NO/13	13.1	68	2	29											
13.30	13.1				NL	<.2	2	<.2	55/179						
13.35	13.2				NL	<.2	2	<.2	42/166						

TESTLINE: 1 **JULIAN DATE:** 227 **YEAR:** 1978-1979 **TEMPLATE IDENTIFICATION:** 1:1.860

TRACKLINE NUMBER: 33

					Length SINGLE GOUGES					Length MULTIPLE GOUGES					
SEGMENT	WATER DEPTH (M)	TOTAL GOUGES	TOTAL NEW GOUGES	%	NEW SINGLE GOUGES	GOUGE DEPTH (M)	GOUGE WIDTH (M)	RIDGE HEIGHT (M)	Ø (°T)	NEW MULTI. GOUGES	NUMBER OF INCIS.	DEEPEST INCISION (M)	DISRUPT WIDTH (M)	Ø (°T)	COMMENTS
OP/14	13.2	73	6	8.2											
14.05	13.5									53	2	NC	7	14/138	
14.45	13.4				60	NC	5	NC	19/143						
14.50	13.2				206	<.2	2	<.2	19/143						
14.50	13.2				NL	<.2	3	<.2	159/103						
14.90	13.8				NL	NC	3	NC	170/114						Continues into next segment
PQ/15	13.8	64	24	37.5											
15.20	13.8				NL	NC	3	NC	170/114						
15.50	14.0									NL	22	NC	95	170/124	multi-gouge extends length of TL and is ∥.
15.80	14.2				25	<.2	2	<.2	148/92						
QR/16	14.1	85	8	9.4											
16.35	14.2				NL	<.2	2	<.2	05/129						
16.55	14.4									NL	4	.2	9	168/112	
16.60	14.2									NL	2	<.2	15	148/92	
16.95	14.4				200	NC	3	NC	168/112						continues into next segment - Terminates direction -112°T
RS/17	14.4	45	3	6.7											Quality of sonar only fair
17.05	14.5				Same as above	NC	3	NC	168/112						
17.20	14.6									NL	2	NC	8	168/112	
ST/18	14.7	76	8	10.5											
18.15	14.9									NL	3	<.2	18	134/78	
18.20	14.8				NL	.2	2	.3	140/84						
18.25	14.7									NL	2	NC	9	14/138	
18.30	14.8				NL	NC	2	NC	160/104						
18.90	15.0				NL	<.2	1	<.2	159/103						

TESTLINE: 1 | JULIAN DATE: 227 | YEAR: 1978-1979 | TEMPLATE IDENTIFICATION: 1: 1.860

TRACKLINE NUMBER: 33					Length SINGLE GOUGES					Length MULTIPLE GOUGES					
SEGMENT	WATER DEPTH (M)	TOTAL GOUGES	TOTAL NEW GOUGES	%	NEW SINGLE GOUGES	GOUGE DEPTH (M)	GOUGE WIDTH (M)	RIDGE HEIGHT (M)	Ø (°T)	NEW MULTI. GOUGES	NUMBER OF INCIS.	DEEPEST INCISION (M)	DISRUPT WIDTH (M)	Ø (°T)	COMMENTS
TU/19	15.0	85	1	1.1											
19.55	15.0				NL	.2	3	<.2	140/84						
UV/20	15.2	—	—	—											ICE DETOUR
VW/21	15.3	—	—	—											ICE DETOUR
WX/22	15.4	71	0	0											
X/end	15.8														

TESTLINE: 1 **JULIAN DATE:** 216 **YEAR:** 1979-1980 **TEMPLATE IDENTIFICATION:** 1:1.379

TRACKLINE NUMBER: 17					Length SINGLE GOUGES					Length MULTIPLE GOUGES					
SEGMENT	WATER DEPTH (M)	TOTAL GOUGES	TOTAL NEW GOUGES	%	NEW SINGLE GOUGES	GOUGE DEPTH (M)	GOUGE WIDTH (M)	RIDGE HEIGHT (M)	Ø (°T)	NEW MULTI. GOUGES	NUMBER OF INCIS.	DEEPEST INCISION (M)	DISRUPT WIDTH (M)	Ø (°T)	COMMENTS CS = 305°T
AB/0	5.5	—	—	-											NO RECORD
BC/1	6.1	—	—	-											NO RECORD
															Shoal height = 1.6 m at Pt. B
CD/2	8.2	40	16	40.0											SSS# 6 BATS# 12
2.75	8.1				68	NC	2	NC	163/108						
2.75	8.1									22	3	NC	10	00/125	
2.80	8.4				37	NC	3	NC	125/70						
2.80	8.4									NL	9	NC	50	137/82	unique gouge termination. direction = 262°T
2.95	8.5				NL	NC	3	NC	150/95						continues into next segment
2.95	8.5				NL	<.2	1	<.2	137/82						continues into next segment
DE/3	8.6	48	30	62.5											
3.01	8.6				NL	NC	3	NC	150/95						
3.05	8.6				NL	<.2	2	<.2	137/82						
3.20	8.7				NL	<.2	2	<.2	137/82						
3.25	8.8				NL	<.2	2	<.2	125/70						
3.40	9.0									NL	8	.2	35	134/79	
3.50	9.3									120	5	NC	17	172/117	
3.65	9.4									NL	3	NC	33	28/153	
3.70	9.4									35	2	NC	8	21/145	direction = 145°T (termination)
3.85	9.7				NL	<.2	2	<.2	147/92						
3.90	9.6									NL	8	<.2	16	145/90	
EF/4	9.8	28	4	14.3											
4.01	9.8				94	NC	2	NC	146/91						
4.25	9.7				37	NC	3	NC	143/88						
4.35	9.8				118	NC	4	NC	158/103						

TESTLINE: 1 | **JULIAN DATE:** 216 | **YEAR:** 1979-1980 | **TEMPLATE IDENTIFICATION:** 1.1.379

TRACKLINE NUMBER: 17

					Length SINGLE GOUGES					Length MULTIPLE GOUGES					
SEGMENT	WATER DEPTH (M)	TOTAL GOUGES	TOTAL NEW GOUGES	%	NEW SINGLE GOUGES	GOUGE DEPTH (M)	GOUGE WIDTH (M)	RIDGE HEIGHT (M)	ø (°T)	NEW MULTI. GOUGES	NUMBER OF INCIS.	DEEPEST INCISION (M)	DISRUPT WIDTH (M)	ø (°T)	COMMENTS
4.35	9.8				46	NC	2	NC	134/79						
FG/5	10.1	96	64	66.7											
5.10	10.2									181	3	<.2	11	136/81	
5.25	10.0				NL	<.2	2	<.2	148/93						
5.30	10.0				33	<.2	1	<.2	135/80						
5.30	10.0				NL	<.2	2	<.2	140/85						
5.35	10.0				176	<.2	1	<.2	149/94						
5.35	10.0				118	<.2	1	<.2	147/92						
5.35	10.0				NL	<.2	3	.2	130/75						
5.45	10.1				59	NC	3	NC	159/104						direction = 261°T (Termination)
5.55	10.0									NL	25	<.2	80	150/95	direction = 275°T (Termination)
5.85	10.0									NL	13	<.2	24	150/95	(older triplet grounds 293°T and then moves off at 95°T)
5.85	10.0									NL	5	<.2	18	155/100	
5.95	10.2									NL	11	<.2	25	137/82	direction = 262°T Termination – See 6.05
GH/6	10.3	61	51	83.6											Beginning of sand wave field
6.05	10.1									NL	13	<.2	45	137/82	circular ◎ see 5.95
6.40	10.0									68	2	<.2	8	151/96	
6.65	10.5				32	<.2	2	<.2	133/78						
6.75	11.0									NL	7	NC	25	35/160	funny bottom in sand wave troughs?
6.85	10.1									93	7	NC	42	34/159	
6.85	10.1									35	6	NC	17	149/94	
6.90	10.7									NL	2	NC	20	40/165	
6.95	10.1									34	8	NC	43	142/87	direction = 267°T
6.95	10.1									82	5	<.2	11	22/147	continues into next segment

TESTLINE: 1 **JULIAN DATE:** 216 **YEAR:** 1979-1980 **TEMPLATE IDENTIFICATION:** 1:1,379

TRACKLINE NUMBER: 17

					Length SINGLE GOUGES					Length MULTIPLE GOUGES					
SEGMENT	WATER DEPTH (M)	TOTAL GOUGES	TOTAL NEW GOUGES	%	NEW SINGLE GOUGES	GOUGE DEPTH (M)	GOUGE WIDTH (M)	RIDGE HEIGHT (M)	Ø (°T)	NEW MULTI. GOUGES	NUMBER OF INCIS.	DEEPEST INCISION (M)	DISRUPT WIDTH (M)	Ø (°T)	COMMENTS
HI/7	10.2	32	14	43.8											Sand waves ht = .8m λ= ~100m
7.01	10.2									82	5	<.2	11	22/147	
7.05	10.9									67	3	NC	12	18/143	
7.80	10.4									NL	6	NC	8	174/119	
IJ/8	11.1	45	10	22.2											
8.30	11.2									NL	10	<.2	43	149/94	
JK/9	11.6	41	5	12.2											
9.45	11.8									37	3	NC	27	117/62	
9.55	11.9				275	NC	2	NC	02/127						
9.95	12.0				NL	NC	3	NC	145/90						Continues into next segment
KL/10	12.1	117	2	1.7											Total gouges maybe low due to machine malfunction.
10.01	12.1				NL	NC	3	NC	145/90						
10.40	12.3				NL	.4	22	.2	63/08						Orientation suspect due to ice detour.
LM/11	12.6	130	8	6.2											large amount of sediment infilling of gouges -
11.15	12.6									NL	2	.2	30	116/61	many smooth patches on seafloor
11.65	12.6									NL	5	NC	22	166/111	
11.70	12.8				NL	.3	8	<.2	117/62						
MN/12	12.7	123	0	0											sediment infilling of gouges
NO/13	12.8	151	1	0.7											
13.35	13.2				NL	<.2	8	<.2	140/85						Sediment infilling of most gouges

TESTLINE: 1 **JULIAN DATE:** 216 **YEAR:** 1979-1980 **TEMPLATE IDENTIFICATION:** 1:1.379

TRACKLINE NUMBER: 17

					Length SINGLE GOUGES					Length MULTIPLE GOUGES					
SEGMENT	WATER DEPTH (M)	TOTAL GOUGES	TOTAL NEW GOUGES	%	NEW SINGLE GOUGES	GOUGE DEPTH (M)	GOUGE WIDTH (M)	RIDGE HEIGHT (M)	Ø (°T)	NEW MULTI. GOUGES	NUMBER OF INCIS.	DEEPEST INCISION (M)	DISRUPT WIDTH (M)	Ø (°T)	COMMENTS
OP/14	13.7	128	3	2.3											sediment infilling
14.75	14.0				NL	.2	8	<.2	143/88						
14.80	14.0									NL	2	<.2	17	143/88	
PQ/15	13.8	171	40	23.4											Sediment infilling
15.15	14.0									NL	4	NC	16	167/112	
15.25	14.0									NL	7	.2	29	150/95	
15.25	14.0									NL	5	NC	25	132/77	
15.45	14.1				NL	.4	3	.5	160/105						
15.50	14.2									50	6	NC	19	158/103	
15.60	14.3				NL	.2	4	<.2	135/80						
15.65	14.0									NL	16	NC	48	150/95	
QR/16	14.3	104	4	3.8											Sonar shutdown makes Total count unreliable -
16.55	14.5									NL	2	.2	15	148/93	sediment infilling
16.75	14.7				NL	<.2	3	<.2	151/96						
16.75	14.8				NL	<.2	2	<.2	151/96						
RS/17	14.8	—	—	–											Sonar shutdown -
ST/18	15.0	76	13	17.1											
18.99	15.1									NL	6	.2	36	159/104	all continue into
18.99	15.1				NL	.3	8	.4	145/90						next
18.99	15.1									NL	6	NC	36	152/97	segment
TU/19	15.1	77	13	16.9											
19.01	15.1									NL	6	.2	36	159/104	sediment infilling
19.01	15.1				NL	.3	8	.4	145/90						

TESTLINE: 1 **JULIAN DATE:** 216 **YEAR:** 1979-1980 **TEMPLATE IDENTIFICATION:** 1:1.379

TRACKLINE NUMBER: 17

					Length SINGLE GOUGES					Length MULTIPLE GOUGES					
SEGMENT	WATER DEPTH (M)	TOTAL GOUGES	TOTAL NEW GOUGES	%	NEW SINGLE GOUGES	GOUGE DEPTH (M)	GOUGE WIDTH (M)	RIDGE HEIGHT (M)	ø (°T)	NEW MULTI. GOUGES	NUMBER OF INCIS.	DEEPEST INCISION (M)	DISRUPT WIDTH (M)	ø (°T)	COMMENTS
19.01	15.1									NL	6	NC	36	52/97	
UV/20	15.6	83	0	0											heavy sediment infilling of gouges
V/END	15.6														

TESTLINE: 1 **JULIAN DATE:** 216 **YEAR:** 1980-1981 **TEMPLATE IDENTIFICATION:** 1:1.633

Trackline Number 27					Length SINGLE GOUGES					Length MULTIPLE GOUGES					
SEGMENT	WATER DEPTH (M)	TOTAL GOUGES	TOTAL NEW GOUGES	%	NEW SINGLE GOUGES	GOUGE DEPTH (M)	GOUGE WIDTH (M)	RIDGE HEIGHT (M)	Ø (°T)	NEW MULTI. GOUGES	NUMBER OF INCIS.	DEEPEST INCISION (M)	DISRUPT WIDTH (M)	Ø (°T)	COMMENTS CS: 305°T
AB/0	5.1	3	—	—											NO 1980 DATA
															SS#14 BATS#18
BC/1	6.3	3	—	—											NO 1980 DATA
															Shoal height = 1.7 m at Pt. B
CD/2	8.5	23	9	39.1											
2.25	8.1				NL	.3	4	.2	155/100						
2.35	7.8				NL	<.2	2	<.2	114/59						
2.55	8.1				NL	<.2	2	<.2	162/107						
2.65	8.5				NL	<.2	3	<.2	145/90						
2.80	8.3				NL	<.2	2	<.2	152/97						
2.85	8.4				NL	<.2	1	<.2	145/90						
2.85	8.4				NL	<.2	2	<.2	14/139						
2.95	8.5				NL	NC	5	NC	116/61						Termination-direction = 61°T
2.95	8.5				NL	<.2	3	<.2	140/85						continues into next segment
DE/3	8.5	47	15	31.9											
3.01	8.5				NL	<.2	3	<.2	140/85						
3.05	8.5				NL	<.2	1	<.2	135/80						
3.15	8.6				NL	<.2	1	<.2	126/71						
3.20	8.6				NL	<.2	2	<.2	122/67						
3.20	8.6									NL	4	NC	34	03/128	
3.20	8.6				NL	<.2	2	<.2	159/104						
3.25	8.7				97	.7	6	<.2	132/77						
3.30	8.7				NL	.3	2	.3	123/68						
3.35	8.9				NL	.2	3	<.2	157/102						
3.60	9.3				42	NC	2	NC	26/151						Termination direction = 151°T
3.65	9.3				45	NC	3	NC	25/150						Termination direction = 150°T
3.85	9.5				NL	.2	4	.3	133/78						

TESTLINE: 1 **JULIAN DATE:** 216 **YEAR:** 1980-1981 **TEMPLATE IDENTIFICATION:** 1:1.633

Trackline Number 27					Length SINGLE GOUGES					Length MULTIPLE GOUGES					
SEGMENT	WATER DEPTH (M)	TOTAL GOUGES	TOTAL NEW GOUGES	%	NEW SINGLE GOUGES	GOUGE DEPTH (M)	GOUGE WIDTH (M)	RIDGE HEIGHT (M)	Ø (°T)	NEW MULTI. GOUGES	NUMBER OF INCIS.	DEEPEST INCISION (M)	DISRUPT WIDTH (M)	Ø (°T)	COMMENTS
EF/4	9.7	27	16	59.3											
4.10	9.7				NL	.3	3	.4	146/91						
4.20	9.7									NL	2	.2	10	157/102	
4.20	9.7				NL	<.2	1	<.2	169/114						
4.25	9.7				NL	<.2	3	<.2	98/43						
4.30	9.7				NL	.2	3	.4	135/80						
4.45	9.7				NL	.2	2	.2	129/74						
4.50	9.7				NL	.2	2	.2	124/69						
4.50	9.7				NL	.4	3	.2	120/65						
4.55	9.8				NL	.2	3	.2	137/82						
4.65	9.8				NL	<.2	4	<.2	133/78						
4.70	9.8				NL	<.2	2	<.2	130/75						
4.75	10.0									NL	3	<.2	12	139/84	Termination direction - 264°T
4.99	10.1				NL	<.2	3	<.2	130/75						
FG/5	10.1	43	9	20.9											
5.05	10.0				NL	<.2	2	<.2	134/79						
5.20	10.0				NL	<.2	5	<.2	136/81						
5.30	10.0				NL	.2	3	.3	136/81						
5.35	10.0									NL	2	<.2	6	135/80	
5.35	10.0				NL	.2	2	<.2	113/58						
5.70	10.1				NL	<.2	3	<.2	133/78						
5.99	10.0									NL	2	<.2	11	168/113	
GH/6	10.0	13	2	15.4											
6.15	10.3				NL	<.2	3	<.2	130/75						
6.50	10.4				NL	<.2	3	<.2	176/121						

TESTLINE: 1 | **JULIAN DATE:** 216 | **YEAR:** 1980-1981 | **TEMPLATE IDENTIFICATION:** 1:1633

Trackline Number 27					Length SINGLE GOUGES					Length MULTIPLE GOUGES					
SEGMENT	WATER DEPTH (M)	TOTAL GOUGES	TOTAL NEW GOUGES	%	NEW SINGLE GOUGES	GOUGE DEPTH (M)	GOUGE WIDTH (M)	RIDGE HEIGHT (M)	ø (°T)	NEW MULTI. GOUGES	NUMBER OF INCIS.	DEEPEST INCISION (M)	DISRUPT WIDTH (M)	ø (°T)	COMMENTS
HI/7	10.7	22	12	54.5											Sediment waves: .8 m high λ= 100 m continues
7.10	10.2				28	<.2	2	<.2	160/105						throughout segment.
7.20	10.3				NL	NC	8	NC	148/93						
7.60	10.5				110	NC	7	NC	160/105						Termination direction - 285°T
7.75	11.0				40	NC	4	NC	155/100						
7.80	10.8				NL	<.2	2	<.2	124/69						
7.85	10.8				NL	<.2	2	<.2	77/22						
7.85	10.5				NL	NC	3	NC	95/90						
7.95	11.2									NL	2	NC	11	150/95	Termination direction - 220°T
7.95	11.2									95	2	NC	14	195/90	68/13 movement: 90°T then 193°T
7.95	11.2				NL	<.2	3	<.2	68/13						
IJ/8	11.1	38	14	36.8											
8.10	11.0				NL	NC	6	NC	21/146						
8.50	11.2				NL	.3	3	.2	115/60						
8.60	11.5				NL	NC	3	NC	135/80						
8.60	11.5									NL	5	<.2	23	153/98	14/143 160/105 = Slope 98°T then 143°T then 10[illegible]
8.65	11.5				NL	NC	4	NC	163/108						
8.80	11.7				NL	<.2	2	<.2	158/103						
8.80	11.7									44	3	NC	10	27/152	Termination direction - 152°T
8.90	11.8				NL	NC	5	NC	145/90						
JK/9	11.6	48	15	31.3											
9.10	11.6									NL	2	.3	10	161/106	
9.20	11.7				NL	.2	3	<.2	112/57						
9.60	12.0									NL	2	<.2	5	164/109	
9.65	12.0				NL	NC	5	NC	130/75						
9.70	12.1									NL	2	<.2	6	126/71	

TESTLINE: 1	JULIAN DATE: 216	YEAR: 1980 - 1981	TEMPLATE IDENTIFICATION: 1:1.633

Trackline Number 27					Length SINGLE GOUGES					Length MULTIPLE GOUGES					
SEGMENT	WATER DEPTH (M)	TOTAL GOUGES	TOTAL NEW GOUGES	%	NEW SINGLE GOUGES	GOUGE DEPTH (M)	GOUGE WIDTH (M)	RIDGE HEIGHT (M)	Ø (°T)	NEW MULTI. GOUGES	NUMBER OF INCIS.	DEEPEST INCISION (M)	DISRUPT WIDTH (M)	Ø (°T)	COMMENTS
9.70	12.1				NL	<.2	2	<.2	130/75						
9.75	12.1									NL	3	.2	12	136/81	
9.85	12.1				NL	.2	6	<.2	115/60						
9.90	12.2									NL	2	NC	43	00/125	continues into next segment - terminates (125+)
KL/10	12.2	87	6	6.9											
10.30	12.5									NL	2	.6	41	170/115	from above - single turns to double incision at mid-seg.
10.60	12.3				NL	NC	2	NC	25/150						
10.75	12.3				NL	.3	3	.4	126/71						
10.80	12.4				NL	.6	11	.5	162/107						very large gouge - disruption width of 30+ m. (con't to next)
10.90	12.6				NL	NC	8	NC	172/117						large gouge continues to next segment
LM/11	12.5	84	11	13.1											
11.05	12.5				70	<.2	2	<.2	149/94						
11.25	12.5				NL	NC	11	NC	166/111						very large from above (10.8)
11.50	12.8				75	NC	2	NC	168/113						
11.50	12.8									NL	3	NC	12	175/120	triple that turns to a single (see 10.9) con't's length of seg.
11.50	12.8				NL	NC	5	NC	175/120						continues into next segment
11.85	13.1				NL	NC	3	NC	140/85						
11.85	13.1									NL	3	NC	10	163/108	changes to single in next segment
MN/12	13.0	86	15	17.4											Start roll (Bals) 19
12.15	13.0									NL	2	NC	10	08/133	
12.25	13.2				NL	.3	3	.5	162/107						(Same as 11.85b)
12.50	13.2				NL	<.2	8	<.2	52/177						
12.50	13.2				NL	NC	5	NC	157/102						
12.50	13.2									NL	3	NC	18	176/121	runs parallel along center line (same as 11.50b)
12.85	13.1				NL	NC	4	NC	176/121						(same as 11.50 a)

TESTLINE: 1	JULIAN DATE: 216	YEAR: 1980 -1981	TEMPLATE IDENTIFICATION: 1:1.633

Trackline Number 27					Length SINGLE GOUGES					Length MULTIPLE GOUGES					
SEGMENT	WATER DEPTH (M)	TOTAL GOUGES	TOTAL NEW GOUGES	%	NEW SINGLE GOUGES	GOUGE DEPTH (M)	GOUGE WIDTH (M)	RIDGE HEIGHT (M)	Ø (°T)	NEW MULTI. GOUGES	NUMBER OF INCIS.	DEEPEST INCISION (M)	DISRUPT WIDTH (M)	Ø (°T)	COMMENTS
12.95	13.4									NL	5	.5	13	152/97	single that turns into multiplet
12.95	13.4				NL	.6	6	.6	118/63						
NO/13	13.4	88	15	17.0											
13.05	13.3									NL	3	NC	15	159/104	(from 12.50c)
13.05	13.3				NL	NC	5	NC	160/105						(from 12.95a)
13.10	13.3				NL	.2	3	<.2	120/65						
13.25	13.5				NL	NC	3	NC	172/117						
13.50	13.5				NL	<.2	2	<.2	158/103						
13.50	13.5				NL	.3	3	<.2	125/70						
13.55	13.4				NL	.3	3	.4	118/63						
13.85	13.7				NL	<.2	3	<.2	166/111						continued into next segment
13.85	13.7									NL	5	.2	19	166/111	
OP/14	13.8	109	22	20.2											
14.05	13.7				NL	NC	3	NC	167/112						
14.05	13.7				178	NC	3	NC	08/133						
14.50	13.8									NL	4	.2	26	171/116	
14.60	13.7				NL	<.2	2	<.2	130/75						
14.80	14.0									NL	4	.2	27	171/116	continues into next segment
14.85	13.8				NL	<.2	5	<.2	128/73						
14.99	13.9									NL	7	NC	32	163/108	continues into next segment
14.99	13.9									NL	3	NC	17	164/109	continues into next segment
PQ/15	13.9	106	30	28.3											
15.05	14.0									NL	3	NC	13	166/111	
15.20	14.0									NL	10	.3	30	167/112	
15.30	14.1									NL	2	.3	10	12.4/69	

TESTLINE: 1 | **JULIAN DATE:** 216 | **YEAR:** 1980–1981 | **TEMPLATE IDENTIFICATION:** 1:1633

Trackline Number 27					Length SINGLE GOUGES					Length MULTIPLE GOUGES					
SEGMENT	WATER DEPTH (M)	TOTAL GOUGES	TOTAL NEW GOUGES	%	NEW SINGLE GOUGES	GOUGE DEPTH (M)	GOUGE WIDTH (M)	RIDGE HEIGHT (M)	Ø (°T)	NEW MULTI. GOUGES	NUMBER OF INCIS.	DEEPEST INCISION (M)	DISRUPT WIDTH (M)	Ø (°T)	COMMENTS
15.30	14.1				NL	.2	4	.5	124/69						
15.30	14.1									NL	3	<.2	12	167/112	
15.45	14.3									NL	3	<.2	11	162/107	
15.50	13.7									NL	2	.2	8	140/85	
15.65	14.4									NL	5	NC	18	160/105	
15.95	14.2				NL	<.2	5	<.2	140/85						continues into next segment
QR/16	14.1	83	7	8.4											
16.01	14.1				NL	<.2	5	<.2	140/85						
16.10	14.4				88	NC	2	NC	05/130						directional changes
16.20	14.2				NL	<.2	8	<.2	59/04						
16.55	14.7				NL	<.2	3	<.2	136/81						
16.75	14.6									NL	3	.3	12	147/92	
RS/17	14.7	75	9	12.0											
17.30	14.8				NL	NC	3	NC	120/65						
17.30	14.8				NL	NC	4	NC	120/65						
17.40	14.9				NL	<.2	3	<.2	124/69						Termination – direction = 249 °T
17.45	14.9									NL	3	.2	12	150/95	
17.65	15.0				NL	NC	7	NC	162/107						
17.70	15.0				NL	<.2	2	<.2	127/72						
17.85	15.0				NL	NC	3	NC	145/90						
S/END	15.0														

TESTLINE: 1	**JULIAN DATE:**	**YEAR:** 1981-1982	**TEMPLATE IDENTIFICATION:** 1:1.379	**CS:** 310°T

TRACKLINE NUMBER: 16

SEGMENT	WATER DEPTH (M)	TOTAL GOUGES	TOTAL NEW GOUGES	%	Length SINGLE GOUGES NEW SINGLE GOUGES	GOUGE DEPTH (M)	GOUGE WIDTH (M)	RIDGE HEIGHT (M)	Ø (°T)	Length MULTIPLE GOUGES NEW MULTI. GOUGES	NUMBER OF INCIS.	DEEPEST INCISION (M)	DISRUPT WIDTH (M)	Ø (°T)	Range 100m * COMMENTS SS# 8 BATS# 10
AB/0	5.4	4	1	25.0											1982 BATS RECORD READS ONE METER SHALLOW. ALL
0.55	7.7				25	<.2	1	<.2	129/79						MEASUREMENTS ADJUSTED BY adding 1m to depths.
															Shorter range may effect total gouge counts. *
BC/1	6.6	3	0	0.0											Pt. B on Crest of shoal Shoal ht = 1.5m
															100m range may also effect resolution of smaller gouges.
CD/2	8.1	26	2	7.7											
2.99	8.5									NL	2	<.2	10	151/101	Continues into next segment.
DE/3	8.5	64	8	12.5											
3.01	8.5									NL	2	<.2	10	151/101	
3.45	9.0				NL	<.2	1	<.2	142/92						
3.85	9.4				NL	<.2	2	<.2	158/108						
3.90	9.4									NL	2	<.2	9	127/77	
3.95	9.4									NL	2	<.2	8	123/73	
EF/4	9.5	50	10	20.0											
4.01	9.5				NL	NC	4	NC	137/87						Terminations: 87°T
4.15	9.5				NL	.2	3	<.2	120/70						
4.25	9.5				NL	.3	3	<.2	98/48						
4.30	9.5									NL	2	<.2	7	116/66	
4.75	9.7				NL	<.2	3	<.2	62/12						
4.75	9.7				62	NC	1	NC	157/107						
4.80	9.8				NL	<.2	2	<.2	137/87						
4.85	9.8				NL	<.2	2	<.2	148/90						
4.90	9.8				NL	<.2	1	<.2	124/74						

TESTLINE: 1 | **JULIAN DATE:** | **YEAR:** 1981-1982 | **TEMPLATE IDENTIFICATION:** 1:1.379

TRACKLINE NUMBER: 16					Length **SINGLE GOUGES**					Length **MULTIPLE GOUGES**					**CS:** 310°T
SEGMENT	**WATER DEPTH (M)**	**TOTAL GOUGES**	**TOTAL NEW GOUGES**	**%**	**NEW SINGLE GOUGES**	**GOUGE DEPTH (M)**	**GOUGE WIDTH (M)**	**RIDGE HEIGHT (M)**	**Ø (°T)**	**NEW MULTI. GOUGES**	**NUMBER OF INCIS.**	**DEEPEST INCISION (M)**	**DISRUPT WIDTH (M)**	**Ø (°T)**	Range = 100 M **COMMENTS**
FG/5	9.8	53	7	13.2											10-20 cm. swell
5.05	9.8				NL	<.2	4	<.2	130/80						
5.10	9.8				NL	.2	3	<.2	130/80						
5.20	9.7				NL	<.2	2	<.2	150/100						
5.20	9.7				NL	.3	5	.3	90/40						
5.30	9.8				NL	<.2	3	<.2	86/36						
5.40	9.8				NL	.2	3	<.2	93/43						
5.50	9.7				NL	<.2	3	<.2	155/105						Termination : 333°T 105 333
GH/6	9.8	22	3	13.4											much movement of sediment. troughs of sand wave field may
6.20	10.2				NL	<.2	1	<.2	165/115						have funny bottom exposed. water depth at trough of sand wave.
6.35	9.7				NL	<.2	1	<.2	140/90						water depth at crest of sand wave
6.80	9.6				NL	<.2	1	<.2	149/99						water depth at crest of sand wave.
HI/7	10.3	31	2	6.5											Extensive sediment movement. troughs have funny bottom.
7.01	10.3				NL	<.2	2	<.2	130/80						
7.65	10.5				NL	.2	2	<.2	138/88						
IJ/8	10.8	64	20	31.3											
8.05	11.1				NL	<.2	2	<.2	145/95						
8.15	10.5									NL	4	.4	16	137/87	⁓ shape
8.30	10.9				NL	<.2	3	<.2	144/94						
8.35	10.8				NL	<.2	3	<.2	128/78						
8.40	11.3				NL	<.2	2	<.2	130/80						
8.45	10.8				NL	<.2	1	<.2	116/66						
8.55	11.3				NL	NC	2	NC	177/127						
8.70	11.2				NL	NC	2	NC	147/97						
8.70	11.2				NL	NC	2	NC	178/128						

TESTLINE: 1 | JULIAN DATE: | YEAR: 1981-1982 | TEMPLATE IDENTIFICATION: 1: 1.374

TRACKLINE NUMBER: 16

					Length SINGLE GOUGES					Length MULTIPLE GOUGES					CS: 310°T
SEGMENT	WATER DEPTH (M)	TOTAL GOUGES	TOTAL NEW GOUGES	%	NEW SINGLE GOUGES	GOUGE DEPTH (M)	GOUGE WIDTH (M)	RIDGE HEIGHT (M)	Ø (°T)	NEW MULTI. GOUGES	NUMBER OF INCIS.	DEEPEST INCISION (M)	DISRUPT WIDTH (M)	Ø (°T)	Range = 100m * COMMENTS
8.70	11.2									NL	2	NC	3	174/124	
8.90	11.3				NL	NC	5	NC	07/137						∿ shape
8.95	11.2				NL	NC	1	NC	172/122						
8.99	11.2				NL	<.2	2	<.2	23/153						continues into next segment
8.99	11.2									NL	2	<.2	6	137/87	
8.99	11.2				NL	<.2	1	<.2	147/97						
JK/9	11.2	85	20	23.5											
9.01	11.2				NL	<.2	2	<.2	23/153						continued from previous segment
9.01	11.2									NL	2	<.2	6	137/87	
9.01	11.2				NL	<.2	1	<.2	147/97						
9.05	11.3				NL	<.2	1	<.2	135/85						
9.10	11.2				NL	<.2	2	<.2	141/91						
9.15	11.2				NL	<.2	2.	<.2	126/76						
9.20	11.2									NL	9	<.2	20	173/123	
9.25	11.2				NL	<.2	2	<.2	151/101						
9.30	11.3				NL	.2	3	.2	131/81						
9.35	11.4									NL	2	.3	20	98/48	
KL/10	11.7	119	6	5.0											100 m Range increases resolution and accounts
10.05	11.5				NL	.3	7	.2	92/42						for high total gouge count.
10.15	11.6				NL	.2	3	.2	153/103						
10.25	11.6				NL	.2	3	.2	105/55						
10.40	11.8				NL	.4	4	.5	40/170						
10.75	11.7				NL	<.2	2	<.2	150/100						
10.80	11.8				NL	<.2	1	<.2	172/122						

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TESTLINE: 1 | **JULIAN DATE:** | **YEAR:** 1981 – 1982 | **TEMPLATE IDENTIFICATION:** 1: 1,379

TRACKLINE NUMBER: 16					Length SINGLE GOUGES					Length MULTIPLE GOUGES					CS: 310 °T
SEGMENT	WATER DEPTH (M)	TOTAL GOUGES	TOTAL NEW GOUGES	%	NEW SINGLE GOUGES	GOUGE DEPTH (M)	GOUGE WIDTH (M)	RIDGE HEIGHT (M)	Ø (°T)	NEW MULTI. GOUGES	NUMBER OF INCIS.	DEEPEST INCISION (M)	DISRUPT WIDTH (M)	Ø (°T)	Range = 100 m COMMENTS
LM/11	12.1	128	6	4.7											100 m range increases resolution and accounts for
11.25	12.1				NL	.2	3	<.2	118/68						high total gouge count.
11.35	12.1				NL	<.2	3	<.2	130/80						
11.40	12.2									NL	2	.2	17	148/98	
11.75	12.2				NL	<.2	1	<.2	132/82						
11.85	12.2				NL	.2	13	.4	128/78						
MN/12	12.4	129	3	2.3											
12.50	12.6									NL	2	.4	13	97/47	
12.85	12.3				NL	1.0	7	.4	102/52						
NO/13	12.6	116	3	2.6											
13.85	12.9				NL	<.2	6	<.2	90/40						
13.95	12.9				NL	.5	11	.5	90/40						
13.99	12.9				NL	.2	5	<.2	90/40						
O/end	12.9														

TESTLINE: 2 | **JULIAN DATE:** | **YEAR:** 1977-1978 | **TEMPLATE IDENTIFICATION:** 1: 1.633

TRACKLINE NUMBER: 17

SEGMENT	WATER DEPTH (M)	TOTAL GOUGES	TOTAL NEW GOUGES	%	Length SINGLE GOUGES NEW SINGLE GOUGES	GOUGE DEPTH (M)	GOUGE WIDTH (M)	RIDGE HEIGHT (M)	ø (°T)	Length MULTIPLE GOUGES NEW MULTI. GOUGES	NUMBER OF INCIS.	DEEPEST INCISION (M)	DISRUPT WIDTH (M)	ø (°T)	CS: 358°T Range: 125M COMMENTS SS# 5 Bats# 9
AB/0	7.3	39	12	30.8											Bottom reworked for entire line. Most older gouges gone.
0.10	7.8				NL	<.2	2	<.2	140/138						Very small gouges
0.15	7.9									NL	4	<.2	42	27/25	Gouge spaced far apart (~5m)
0.25	8.6									NL	7	<.2	27	45/43	
BC/1	10.2	8	4	50.0											
1.20	10.5									NL	3	<.2	16	44/42	Termination: 154°T
1.99	11.5				NL	<.2	2	<.2	17/15						continues into next segment
CD/2	11.5	5	1	20.0											fields of sand waves where many gouges used to be -
2.01	11.5				NL	<.2	2	<.2	17/15						trough orien: 161°T λ≈7m continued from previous seg.
DE/3	11.7	24	22	91.7											2.3m shoal. New gouges on shoal crest. Sed. waves sea-
3.50	10.9				24	<.2	1	<.2	113/111						ward of shoal. / on inside of shoal. Termination: 111°T
3.65	9.5									NL	13	<.2	75	114/112	Pressure ridge on shoal crest. Most gouges on crest
3.65	9.5				31	<.2	1	<.2	40/38						Termination: 38°T
3.70	10.1									38	2	<.2	6	149/147	Termination: 147°T
3.70	10.1				48	<.2	2	<.2	163/161						Termination: 161°T
3.70	10.1				45	NC	3	NC	165/163						Termination: 163°T
3.70	10.1				NL	<.2	2	<.2	38/36						
3.70	10.1				23	<.2	2	<.2	177/175						Termination: 175°T
3.90	12.1				NL	<.2	2	<.2	19/17						seaward of shoal
EF/4	12.4	3	1	33.3											asymetrical dunes - current direction onshore (~)
4.85	13.1				NL	<.2	7	<.2	85/83						sed. dune complex (seen annually in same place)
															orientation of crests: 01°T (funny bottom?)(window?)
															gouge appears as a wide, shallow scrape

TESTLINE: 2 | **JULIAN DATE:** | **YEAR:** 1977-1978 | **TEMPLATE IDENTIFICATION:** 1:1.633

TRACKLINE NUMBER: 17

					Length SINGLE GOUGES					Length MULTIPLE GOUGES					CS: 358°T
SEGMENT	WATER DEPTH (M)	TOTAL GOUGES	TOTAL NEW GOUGES	%	NEW SINGLE GOUGES	GOUGE DEPTH (M)	GOUGE WIDTH (M)	RIDGE HEIGHT (M)	Ø (°T)	NEW MULTI. GOUGES	NUMBER OF INCIS.	DEEPEST INCISION (M)	DISRUPT WIDTH (M)	Ø (°T)	Range 125 m COMMENTS
FG/5	13.5	62	30	48.4											Older shallow(infilled) gouges Normal to line and can not
5.05	13.5									NL	5	<.2	30	120/118	be resolved. Count may be higher of total gouges.
5.30	13.6				40	NC	2	NC	57/55						
5.50	14.0									94	5	NC	22	09/07	
5.50	14.0									200	7	NC	30	28/26	Termination: 26T 26 170
5.95	14.2									NL	2	<.2	16	146/144	
5.99	14.3				NL	.2	7	.4	28/26						}con't into next segment
5.99	14.3									NL	9	NC	25	150/148	148 25
GH/6	14.3	32	17	53.1											
6.01	14.3				NL	.2	7	.4	28/26						Poor resolution of gouges normal to trackline.
6.01	14.3									NL	9	NC	25	150/148	
6.10	14.4				NL	<.2	2	<.2	55/53						
6.20	14.4									NL	2	<.2	16	65/63	
6.40	14.5				NL	<.2	5	.2	52/50						
6.40	14.5				NL	<.2	1	<.2	42/40						
6.65	14.6				NL	<.2	2	<.2	52/50						
6.80	14.8				NL	<.2	2	<.2	85/83						
HI/7	15.1	13	4	30.8											sediment waves and other traction features.
7.35	14.7									NL	4	<.2	20	61/59	
IJ/8	14.5	51	23	45.1											3.6 m shoal at mid segment. NEW GOUGES ON SHOAL CREST
8.50	11.4				NL	<.2	1	<.2	90/88						MAJOR CHANGE IN GOUGING - Between years
8.50	11.4				NL	<.2	1	<.2	125/123						
8.50	11.4				NL	<.2	1	<.2	125/123						
8.50	11.4				NL	<.2	2	<.2	136/134						
8.50	11.4				NL	<.2	1	<.2	110/108						

TESTLINE: 2 | **JULIAN DATE:** | **YEAR:** 1977-1978 | **TEMPLATE IDENTIFICATION:** 1:1.633

TRACKLINE NUMBER: 17

					Length SINGLE GOUGES					Length MULTIPLE GOUGES					CS: 358°T
SEGMENT	WATER DEPTH (M)	TOTAL GOUGES	TOTAL NEW GOUGES	%	NEW SINGLE GOUGES	GOUGE DEPTH (M)	GOUGE WIDTH (M)	RIDGE HEIGHT (M)	Ø (°T)	NEW MULTI. GOUGES	NUMBER OF INCIS.	DEEPEST INCISION (M)	DISRUPT WIDTH (M)	Ø (°T)	125 M RANGE COMMENTS
8.50	11.4				NL	<.2	2	<.2	115/113						
8.50	11.4				46	<.2	1	<.2	02/00						
8.50	11.4				NL	<.2	2	<.2	132/130						
8.50	11.4									NL	2	<.2	5	03/01	
8.50	11.4				NL	<.2	2	<.2	55/53						
8.50	11.4				NL	NC	5	NC	125/123						Termination: 303°T
8.50	11.4				NL	<.2	2	<.2	135/133						
8.50	11.4				NL	<.2	4	<.2	100/98						
8.50	11.4				NL	<.2	1	<.2	115/113						
8.50	11.4				NL	<.2	2	<.2	140/138						
8.50	11.4				NL	<.2	1	<.2	158/156						
8.50	11.4				NL	<.2	1	<.2	01/179						
8.50	11.4				NL	<.2	2	<.2	115/113						
8.50	11.4				NL	<.2	1	<.2	176/174						
8.50	11.4				NL	<.2	1	<.2	50/48						
8.50	11.4				NL	<.2	1	<.2	151/149						
8.50	11.4				NL	<.2	2	<.2	158/156						
JK/9	14.4	18	0	0.0											old gouges are very feint. NO NEW GOUGES DUE TO SHOAL LEE?
KL/10	15.3	13	8	69.2											1.8 m shoal at mid segment sed. waves on shoal crest.
10.55	14.3				34	NC	3	NC	17/15						GOUGES ON SEAWARD SIDE OF SHOAL.
10.55	14.3				12	NC	2	NC	15/13						
10.55	14.3									NL	2	<.2	18	109/107	
10.60	14.7				22	NC	3	NC	151/149						
10.65	14.9									NL	2	<.2	12	104/102	
10.75	15.0				NL	<.2	3	<.2	68/66						

TESTLINE: 2 | **JULIAN DATE:** | **YEAR:** 1977-1978 | **TEMPLATE IDENTIFICATION:** 1:1.633

TRACKLINE NUMBER: 17					Length SINGLE GOUGES					Length MULTIPLE GOUGES					CS: 358°T
SEGMENT	WATER DEPTH (M)	TOTAL GOUGES	TOTAL NEW GOUGES	%	NEW SINGLE GOUGES	GOUGE DEPTH (M)	GOUGE WIDTH (M)	RIDGE HEIGHT (M)	Ø (°T)	NEW MULTI. GOUGES	NUMBER OF INCIS.	DEEPEST INCISION (M)	DISRUPT WIDTH (M)	Ø (°T)	Range 125M COMMENTS
LM/11	15.7	19	13	68.4											sed. dunes - ←TO SHORE
11.60	16.4				75	NC	2	NC	32/30						
11.70	16.2									105	5	NC	13	33/31	
11.80	16.6				NL	<.2	2	<.2	48/46						
11.85	16.7									NL	4	NC	27	90/88	
11.90	16.3				NL	<.2	2	<.2	112/110						
11.99	16.7				NL	.2	8	.3	87/85						
MN/12	16.7	15	11	73.3											
12.10	16.9				NL	.4	3	<.2	77/75						
12.15	16.9									NL	3	<.2	17	115/113	
12.15	16.9				NL	<.2	1	<.2	99/97						
12.15	16.9				NL	<.2	2	.2	62/60						
12.20	16.8				NL	.2	3	.3	88/86						
12.45	16.9				NL	<.2	2	<.2	90/88						
12.50	17.0									NL	3	<.2	25	90/88	
NO/13	17.5	27	17	60.7											
13.05	17.5				NL	.5	20	.3	90/88						
13.15	17.5				NL	<.2	2	<.2	127/125						
13.25	17.5									35	3	NC	16	27/25	Termination: 205°T
13.30	17.5				NL	.7	10	.8	93/91						
13.35	17.6				NL	.2	4	<.2	103/101						
13.35	17.6				NL	<.2	2	<.2	88/86						
13.35	17.6				NL	.4	8	.2	100/98						
13.40	17.7									NL	2	<.2	.8	160/158	
13.95	18.0									NL	6	.5	57	92/90	

TESTLINE: 2 | **JULIAN DATE:** | **YEAR:** 1977-1978 | **TEMPLATE IDENTIFICATION:** 1:1,633

TRACKLINE NUMBER: 17					Length SINGLE GOUGES					Length MULTIPLE GOUGES					CS: 358°T
SEGMENT	WATER DEPTH (M)	TOTAL GOUGES	TOTAL NEW GOUGES	%	NEW SINGLE GOUGES	GOUGE DEPTH (M)	GOUGE WIDTH (M)	RIDGE HEIGHT (M)	Ø (°T)	NEW MULTI. GOUGES	NUMBER OF INCIS.	DEEPEST INCISION (M)	DISRUPT WIDTH (M)	Ø (°T)	Range 125 m COMMENTS
OP/14	18.3	17	7	41.2											sed. dunes
14.25	18.3				NL	<.2	2	<.2	89/87						
14.65	18.4				NL	<.2	2	<.2	93/91						
14.99	18.5									NL	5	.5	55	98/96	
P/End	18.5														

TESTLINE: 2 **JULIAN DATE:** **YEAR:** 1978-1979 **TEMPLATE IDENTIFICATION:** 1:1.633

TRACKLINE NUMBER: 31

					Length SINGLE GOUGES					Length MULTIPLE GOUGES					CS: 358°T
SEGMENT	WATER DEPTH (M)	TOTAL GOUGES	TOTAL NEW GOUGES	%	NEW SINGLE GOUGES	GOUGE DEPTH (M)	GOUGE WIDTH (M)	RIDGE HEIGHT (M)	Ø (°T)	NEW MULTI. GOUGES	NUMBER OF INCIS.	DEEPEST INCISION (M)	DISRUPT WIDTH (M)	Ø (°T)	Range = 125 m COMMENTS SS#10 Bats#10a.
AB/0	6.5	9	0	0.0											Poor resolution on outer edges of sonar.
BC/1	9.9	6	1	16.7											Ribbons of sediment. reworking?
1.15	10.2				NL	<.2	3	<.2	48/46						Sand Ribbons (darker return) with ripples: Trough θ = 24°T
															2m wave length; ht = <.2 m reworking indicated.
CD/2	11.3	25	25	100.0											
2.95	11.4									NL	11	<.2	50	22/20	
2.99	11.3									NL	14	<.2	47	20/18	
DE/3	11.3	44	44	100.0											
3.55	10.1				NL	<.2	3	<.2	57/55						2.5 m shoal at end of segment. Most gouging
3.55	10.1				NL	<.2	2	.3	65/63						on shoal crest. Sed waves on seaward side of shoal
3.60	9.2									25	6	<.2	15	19/17	
3.60	9.2				62	<.2	2	<.2	146/144						
3.65	9.1				NL	<.2	2	<.2	108/106						
3.65	9.1				NL	<.2	1	<.2	125/123						
3.65	9.1				NL	<.2	1	<.2	135/133						
3.70	9.5									NL	27	.2	103	147/145	Pressure Ridge scour
3.75	10.2				NL	.2	3	.2	98/96						
3.75	10.2									NL	2	<.2	7	50/48	Gouges on seaward side
3.80	11.6				NL	<.2	2	<.2	52/50						of shoal
3.85	11.8				NL	<.2	3	<.2	42/40						
EF/4	12.1	12	12	100.0											
4.10	12.3				NL	<.2	2	<.2	73/71						
4.25	12.5				NL	<.2	2	<.2	77/75						
4.25	12.5				NL	<.2	3	<.2	60/59						
4.40	11.8				NL	<.2	2	<.2	109/107						Termination: 287°T
															Sand Wave Field.

TESTLINE: 2
JULIAN DATE:
YEAR: 1978 - 1979
TEMPLATE IDENTIFICATION: 1 : 1.633

TRACKLINE NUMBER: 31					Length SINGLE GOUGES					Length MULTIPLE GOUGES					CS: 358°T
SEGMENT	WATER DEPTH (M)	TOTAL GOUGES	TOTAL NEW GOUGES	%	NEW SINGLE GOUGES	GOUGE DEPTH (M)	GOUGE WIDTH (M)	RIDGE HEIGHT (M)	Ø (°T)	NEW MULTI. GOUGES	NUMBER OF INCIS.	DEEPEST INCISION (M)	DISRUPT WIDTH (M)	Ø (°T)	COMMENTS
4. 40	11.8				NL	<.2	2	<.2	94/92						
4. 40	11.8				NL	<.2	2	<.2	130/128						Termination : 128°T
4.50	11.9									NL	4	<.2	10	133/131	
4.50	11.9									NL	2	<.2	4	128/126	
FG/5	13.2	20	1	5.0											reworking of seafloor.
5.60	14.0				NL	<.2	2	<.2	74/72						
GH/6	14.1	6	0	0.0											ICE DETOUR AT END OF LINE
HI/7	15.0	1	0	0.0											Sed. waves indicate reworking of seafloor. θ=175°T λ=2m
IJ/8	14.4	23	20	87.0											3.7 m shoal mid segment. MOST GOUGING on shoal
8.50	13.1				NL	<.2	2	<.2	88/86						crest. Reworking of old gouges indicated.
8.55	12.0				18	<.2	2	<.2	124/122						Termination: 122°T
8.55	12.0				NL	<.2	3	<.2	164/162						
8.60	11.3									NL	6	<.2	12	03/01	
8.60	11.3				NL	<.2	2	<.2	118/116						
8-60	11.2				NL	<.2	1	<.2	120/118						
8. 65	11.6									NL	2	<.2	11	126/124	
8. 75	13.1									NL	7	<.2	17	170/168	
JK/9	14.6	1	0	0.0											reworking -
KL/10	15.1	14	9	64.3											1.8 m shoal mid segment.
10.55	13.9									15	5	<.2	7	168/166	Termination: 166°T
10.60	14.2									30	3	NC	7	08/06	Termination: 186°T a
10.95	15,3				NL	.2	3	<.2	113/111						

TESTLINE: 2 **JULIAN DATE:** **YEAR:** 1978-1979 **TEMPLATE IDENTIFICATION:** 1:1.633

TRACKLINE NUMBER: 31					Length SINGLE GOUGES					Length MULTIPLE GOUGES					CS: 358 °T
SEGMENT	WATER DEPTH (M)	TOTAL GOUGES	TOTAL NEW GOUGES	%	NEW SINGLE GOUGES	GOUGE DEPTH (M)	GOUGE WIDTH (M)	RIDGE HEIGHT (M)	Ø (°T)	NEW MULTI. GOUGES	NUMBER OF INCIS.	DEEPEST INCISION (M)	DISRUPT WIDTH (M)	Ø (°T)	COMMENTS
LM/11	15.5	2	0	0.0											
MN/12	16.3	4	1	25.0											
12.50	16.6				NL	NC	3	NC	115/113						Termination: 113 °T
N/end	NMP														loss of fathogram

TESTLINE: 2 **JULIAN DATE:** 215 **YEAR:** 1979-1980 **TEMPLATE IDENTIFICATION:** 1:1.379

TRACKLINE NUMBER: 16

					Length SINGLE GOUGES					Length MULTIPLE GOUGES					CS: 358°T Range = 125m
SEGMENT	WATER DEPTH (M)	TOTAL GOUGES	TOTAL NEW GOUGES	%	NEW SINGLE GOUGES	GOUGE DEPTH (M)	GOUGE WIDTH (M)	RIDGE HEIGHT (M)	ø (°T)	NEW MULTI. GOUGES	NUMBER OF INCIS.	DEEPEST INCISION (M)	DISRUPT WIDTH (M)	ø (°T)	COMMENTS SS# 5 Bds# 11b
AB/0	6.9	5	0	0.0											
BC/1	9.9	0	0	0.0											
CD/2	11.3	1	0	0.0											Sand waves - Bottom reworked crest orien: 160°T λ = 2m
DE/3	11.5	26	21	80.8											2m shoal at midsegment. most gouging on shoal crest.
3.15	11.6									NL	4	<.2	27	87/85	
3.45	10.8									32	3	<.2	8	178/176	
3.45	10.8				20	<.2	1	<.2	174/172						
3.60	9.2									NL	9	.2	36	110/108	Pressure ridge scouring
3.70	10.1				NL	<.2	2	<.2	47/45						
3.70	10.1				37	<.2	1	<.2	128/126						
3.70	10.1				NL	<.2	2	.2	80/78						
3.75	10.9				44	<.2	3	<.2	05/03						
EF/4	12.2	9	0	0.0											
FG/5	13.3	1	1	100.0											
5.45	13.7				NL	<.2	2	<.2	40/38						Termination: 218°T
GH/6	14.1	7	2	28.6											
6.60	14.5				NL	<.2	7	<.2	71/69						TICK MARKS - λ = 2M
6.75	14.7				NL	<.2	5	<.2	79/77						Tick Marks - λ = 2m
HI/7	15.0	7	1	14.3											
7.70	14.4				NL	<.2	2	<.2	140/138						change template: 1:1.633
															sed. waves θ trough = 168°T λ = 2M

TESTLINE: 2 | **JULIAN DATE:** 215 | **YEAR:** 1979-1980 | **TEMPLATE IDENTIFICATION:** 1: 1.633

TRACKLINE NUMBER: 16					Length SINGLE GOUGES					Length MULTIPLE GOUGES					CS: 358 °T
SEGMENT	WATER DEPTH (M)	TOTAL GOUGES	TOTAL NEW GOUGES	%	NEW SINGLE GOUGES	GOUGE DEPTH (M)	GOUGE WIDTH (M)	RIDGE HEIGHT (M)	Ø (°T)	NEW MULTI. GOUGES	NUMBER OF INCIS.	DEEPEST INCISION (M)	DISRUPT WIDTH (M)	Ø (°T)	COMMENTS
IJ/8	14.2	17	14	82.4											3.7 m shoal at mid segment. gouging on shoal.
8.45	13.0				NL	<.2	2	<.2	110/108						Termination: 288°T
8.50	12.5				NL	<.2	2	<.2	91/89						
8.50	12.0									NL	4	.2	14	115/113	Termination: 293°T
8.55	11.5									NL	4	<.2	15	120/118	Termination: 298°T
8.60	11.3				NL	<.2	4	<.2	93/91						
8.65	12.2				NL	<.2	3	<.2	109/107						
8.65	12.2				NL	<.2	2	<.2	72/70						
8.75	14.2				NL	<.2	2	<.2	55/53						
JK/9	14.2	0	0	0.0											
KL/10	15.0	3	2	66.7											2m shoal at mid segment. New gouges seaward side.
10.60	14.4				NL	<.2	1	<.2	124/122						
10.65	14.7				NL	<.2	2	<.2	138/136						Termination: 136°T
LM/11	15.1	3	1	33.3											
11.05	15.1				NL	<.2	1	<.2	122/120						
MN/12	16.2	6	4	66.7											
12.40	16.5				NL	<.2	4	<.2	127/125						
12.70	16.4				NL	<.2	2	<.2	58/56						
12.80	16.7				NL	.3	3	.3	73/71						
12.95	17.2				NL	<.2	3	<.2	66/64						
N/end	16.9														end of 1979 records.

TESTLINE: 2 | **JULIAN DATE:** 216 | **YEAR:** 1980-1981 | **TEMPLATE IDENTIFICATION:** 1:1,633

TRACKLINE NUMBER: 26					Length SINGLE GOUGES					Length MULTIPLE GOUGES					CS: 358°T
SEGMENT	WATER DEPTH (M)	TOTAL GOUGES	TOTAL NEW GOUGES	%	NEW SINGLE GOUGES	GOUGE DEPTH (M)	GOUGE WIDTH (M)	RIDGE HEIGHT (M)	Ø (°T)	NEW MULTI. GOUGES	NUMBER OF INCIS.	DEEPEST INCISION (M)	DISRUPT WIDTH (M)	Ø (°T)	Range = 125 m COMMENTS SS #14 Bats #18
AB/0	7.0	8	2	25.0											Fathogram malfunction until segment 7 (HI).
0.10	7.3				NL	<.2	5	<.2	83/81						Better resolution on 1981 sonar than 1980. Accounts for gouge total difference.
0.60	—				NL	<.2	4	<.2	90/88						Termination: 266°T
BC/1	—	8	5	62.5											
1.05	—				NL	<.2	2	<.2	77/75						Termination: 255°T
1.15	—				NL	<.2	2	<.2	66/64						
1.35	—				NL	<.2	2	<.2	47/44						
1.35	—				NL	<.2	2	<.2	75/73						
1.70	—				NL	<.2	2	<.2	53/51						
CD/2	-	4	2	50.0											
2.10	-				NL	<.2	2	<.2	69/67						
2.99	-				NL	<.2	2	<.2	77/75						
DE/3	—	29	25	86.2											2.3 meter shoal at midsegment. Most gouging on shoal crest.
3.05	-				NL	<.2	2	<.2	97/95						
3.45	-									NL	2	—	23	90/88	
3.50	-									NL	5	<.2	15	128/126	
3.60	-				NL	<.2	3	<.2	47/45						
3.50	-				NL	<.2	3	<.2	127/125						
3.50	-									NL	3	NC	20	127/125	Termination: 125°T
3.55	-									NL	2	NC	15	119/117	Termination: 117°T
3.60	-									NL	4	NC	17	125/123	Termination: 123°T
3.60	-									NL	2	<.2	9	102/100	
3.60	-									NL	2	<.2	8	115/113	
3.65	-				NL	<.2	3	<.2	125/123						
3.70	-				NL	<.2	3	<.2	69/67						

TESTLINE: 2 | JULIAN DATE: 216 | YEAR: 1980-1981 | TEMPLATE IDENTIFICATION: 1:1,633

TRACKLINE NUMBER: 26

SEGMENT	WATER DEPTH (M)	TOTAL GOUGES	TOTAL NEW GOUGES	%	Length SINGLE GOUGES: NEW SINGLE GOUGES	GOUGE DEPTH (M)	GOUGE WIDTH (M)	RIDGE HEIGHT (M)	Ø (°T)	Length MULTIPLE GOUGES: NEW MULTI. GOUGES	NUMBER OF INCIS.	DEEPEST INCISION (M)	DISRUPT WIDTH (M)	Ø (°T)	CS: 358°T COMMENTS
EF/4	—	9	7	77.8											
4.05	–				NL	<.2	1	<.2	95/93						
4.15	–				NL	<.2	2	<.2	32/30						
4.25	–				NL	—	4	—	106/104						
4.35	–				NL	NC	4	NC	170/168						Termination: 168°T
4.60	–				NL	<.2	2	<.2	83/81						
4.60	–				NL	<.2	2	<.2	107/105						
4.85	–				NL	<.2	2	<.2	82/80						
FG/5	–	8	6	75.0											
5.05	–				NL	<.2	3	<.2	120/118						Termination: 118°T
5.15	–				NL	<.2	2	<.2	124/122						
5.15	–				NL	<.2	2	<.2	117/115						
5.20	–				NL	<.2	2	<.2	115/113						
5.95	–				NL	<.2	1	<.2	55/53						
5.99	–				NL	<.2	1	<.2	105/103						Continues into next segment.
GH/6	–	6	2	33.3											
6.01	–				NL	<.2	1	<.2	105/103						
6.65	–				NL	<.2	2	<.2	107/105						
HI/7	14.6	0	0	0.0											
IJ/8	14.3	14	14	100.0											3.5 meter shoal at mid segment. Most gouging on shoal crest.
8.40	12.3				NL	<.2	3	.2	125/123						
8.45	11.5				NL	<.2	4	<.2	88/86						
8.45	11.5				NL	.2	3	.2	132/130						
8.45	11.5				NL	<.2	3	.2	135/133						

TESTLINE: 2 **JULIAN DATE:** 216 **YEAR:** 1980 - 1981 **TEMPLATE IDENTIFICATION:** 1: 1.633

TRACKLINE NUMBER: 26

CS: 358°T

					Length SINGLE GOUGES					Length MULTIPLE GOUGES					
SEGMENT	WATER DEPTH (M)	TOTAL GOUGES	TOTAL NEW GOUGES	%	NEW SINGLE GOUGES	GOUGE DEPTH (M)	GOUGE WIDTH (M)	RIDGE HEIGHT (M)	Ø (°T)	NEW MULTI. GOUGES	NUMBER OF INCIS.	DEEPEST INCISION (M)	DISRUPT WIDTH (M)	Ø (°T)	COMMENTS
8.50	11.1				NL	.2	8	.2	38/36						
8.50	11.1				NL	<.2	1	<.2	52/50						
8.55	11.5				NL	<.2	3	<.2	56/54						
8.70	13.0									NL	2	.2	9	124/122	
8.75	13.3				NL	<.2	2	<.2	58/56						
8.75	13.3				NL	<.2	1	<.2	50/48						
8.80	13.4				NL	<.2	1	<.2	123/121						
8.80	13.4									NL	2	<.2	19	128/128	
JK/9	14.0	7	7	100.0											
9.05	14.0				NL	.2	3	.2	90/88						
9.10	14.0				NL	<.2	3	<.2	82/80						
9.10	14.0				NL	.4	5	.5	112/110						Termination: 110 °T
9.15	14.5				NL	<.2	3	<.2	48/46						
9.25	14.6				15	<.2	2	<.2	128/126						
9.40	14.8				NL	.2	2	<.2	95/93						
9.45	14.7				NL	<.2	4	<.2	110/108						Termination: 108°T
KL/10	15.0	7	7	100.0											1.4 m shoal at mid segment.
10.50	14.1				NL	.2	5	.3	53/51						
10.50	14.1				NL	<.2	6	.2	118/116						
10.50	14.1				NL	<.2	6	<.2	117/115						
10.75	15.0									NL	2	<.2	23	110/108	
10.85	15.3				NL	<.2	2	<.2	174/172						
10.90	15.3				NL	<.2	2	<.2	168/176						

TESTLINE: 2 | **JULIAN DATE:** 216 | **YEAR:** 1980-1981 | **TEMPLATE IDENTIFICATION:** 1:1,633

TRACKLINE NUMBER: 26

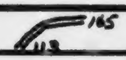
					Length SINGLE GOUGES					Length MULTIPLE GOUGES					CS: 358°T
SEGMENT	WATER DEPTH (M)	TOTAL GOUGES	TOTAL NEW GOUGES	%	NEW SINGLE GOUGES	GOUGE DEPTH (M)	GOUGE WIDTH (M)	RIDGE HEIGHT (M)	Ø (°T)	NEW MULTI. GOUGES	NUMBER OF INCIS.	DEEPEST INCISION (M)	DISRUPT WIDTH (M)	Ø (°T)	COMMENTS
LM/11	15.3	15	14.	933											
11.15	15.6				NL	<.2	3	<.2	95/93						
11.30	15.5				NL	NC	4	NC	168/166						Termination :039°T
11.35	15.5				NL	.3	10	.3	119/117						
11.55	16.0				NL	.2	13	<.2	112/110						
11.60	16.0				NL	.5	10	.4	100/98						
11.65	16.0				NL	.2	2	<.2	100/98						
11.70	16.4				NL	<.2	1	<.2	118/116						
11.80	16.0				NL	.4	5	.5	101/99						
11.85	16.0				NL	<.2	3	<.2	102/100						
11.90	15.5				NL	<.2	2	<.2	103/101						
11.90	15.5				NL	.8	3	<.2	113/111						
11.95	15.8				NL	1.4	8	.9	69/67						
11.95	15.9				NL	.3	4	.3	106/104						
11.95	15.9				NL	.2	2	.4	109/107						
NW/12	16.0	23	19	82.6											
12.01	16.0				NL	.2	2	<.2	122/120						
12.20	16.4				NL	<.2	2	<.2	111/109						
12.25	16.8				NL	.2	5	<.2	66/64						
12.25	16.8				NL	.2	3	.2	133/131						
12.30	16.7				NL	<.2	2	<.2	135/133						
12.35	16.6				NL	.2	3	.2	70/72						
12.35	16.6				NL	<.2	3	<.2	123/121						
12.35	16.6				NL	.2	2	<.2	74/72						
12.40	16.6				NL	.2	2	.2	36/34						
12.45	16.6				NL	<.2	2	<.2	163/161						
12.50	16.4				NL	<.2	2	<.2	00/178						parallels length of segment.

TESTLINE: 2 | **JULIAN DATE:** 216 | **YEAR:** 1980-1981 | **TEMPLATE IDENTIFICATION:** 1: 1,633

TRACKLINE NUMBER: 26					**Length SINGLE GOUGES**					**Length MULTIPLE GOUGES**					**CS: 358°T**
SEGMENT	**WATER DEPTH (M)**	**TOTAL GOUGES**	**TOTAL NEW GOUGES**	**%**	**NEW SINGLE GOUGES**	**GOUGE DEPTH (M)**	**GOUGE WIDTH (M)**	**RIDGE HEIGHT (M)**	**Ø (°T)**	**NEW MULTI. GOUGES**	**NUMBER OF INCIS.**	**DEEPEST INCISION (M)**	**DISRUPT WIDTH (M)**	**Ø (°T)**	**COMMENTS**
12.80	17.2				NL	<.2	3	<.2	114/112						
12.85	17.0									NL	3	<.2	25	107/105	
12.90	17.0				NL	<.2	2	<.2	107/105						
12.90	17.0				NL	.2	5	<.2	70/68						
12.99	17.2									NL	2	.3	25	80/78	
NO/13	17.2	16	8	50.0											
13.01	17.2				NL	<.2	4	<.2	103/101						
13.25	17.4				NL	.2	4	.2	92/90						
13.30	17.5				NL	.3	5	.3	116/114						
13.50	17.5				NL	<.2	2	<.2	121/119						
13.65	17.8				NL	.2	3	<.2	129/127						
13.80	18.0				NL	<.2	3	<.2	98/96						
13.90	17.8				NL	<.2	4	<.2	97/95						
13.95	17.7				NL	.2	2	<.2	120/118						
0/end	17.4														

TESTLINE: 3		**JULIAN DATE:** 250			**YEAR:** 1981-1982					**TEMPLATE IDENTIFICATION:** 1:1.067					
TRACKLINE NUMBER: 12					**Length**	**SINGLE GOUGES**				**Length**	**MULTIPLET GOUGES**				**COURSE:** 000 °T.
SEGMENT	**WATER DEPTH (M)**	**TOTAL GOUGES**	**TOTAL NEW GOUGES**	**%**	**NEW SINGLE GOUGES**	**GOUGE DEPTH (M)**	**GOUGE WIDTH (M)**	**RIDGE HEIGHT (M)**	**Ø (°T)**	**NEW MULTI. GOUGES**	**NUMBER OF INCIS.**	**DEEPEST INCISION (M)**	**DISRUPT WIDTH (M)**	**Ø (°T)**	**COMMENTS** SS# 6 BATS# 8
AB/0	11.5	6	6	100.											Fathogram 1m too shallow. Add 1m to
0.10	11.3				35	<.2	2	<.2	167/167						water depths.
0.40	11.9									NL	3	<.2	13	168/168	Sonar only fair quality. All gouges
0.40	11.9				13	<.2	2	<.2	170/170						are small discontinuous scratches on seafloor.
0.45	12.0				16	<.2	1	<.2	156/156						
0.95	12.4				34	<.2	3	<.2	142/142						
BC/1	12.5	7	7	100.											
1.08	12.6				15	NC	3	NC	167/167						
1.05	12.6				NL	<.2	1	<.2	159/159						
1.30	12.9				NL	<.2	2	<.2	133/133						
1.45	13.3									NL	3	<.2	13	165/165	
1.90	13.3				NL	<.2	1	<.2	103/103						
CD/2	12.3	6	6	100.											Shoal (3m high) at end of segment. Gouges on crest.
2.75	10.2									NL	2	<.2	7	142/142	
2.85	10.7				NL	<.2	1	<.2	167/167						
2.85	10.7				NL	<.2	2	<.2	152/152						Termination: 152°T
2.90	11.4				NL	<.2	2	<.2	151/151						
2.90	11.4				NL	<.2	1	<.2	150/150						
DE/3	12.0	15	11	73.3											Change template — 1:1.633
3.01	12.0				NL	NC	3	NC	97/97						Termination: 97°T
3.05	12.4				12	<.2	1	<.2	176/176						moraine at end of term.
3.25	13.3				NL	<.2	2	<.2	122/122						
3.30	13.5				NL	<.2	1	<.2	117/117						
3.30	13.5				NL	<.2	1	<.2	118/118						
3.35	13.7				NL	<.2	2	<.2	91/91						

TESTLINE: 3	JULIAN DATE: 250	YEAR: 1981-1982	TEMPLATE IDENTIFICATION: 1:1.067

TRACKLINE NUMBER: 12					Length	SINGLE GOUGES				Length	MULTIPLET GOUGES				COURSE: 000°T
SEGMENT	WATER DEPTH (M)	TOTAL GOUGES	TOTAL NEW GOUGES	%	NEW SINGLE GOUGES	GOUGE DEPTH (M)	GOUGE WIDTH (M)	RIDGE HEIGHT (M)	ø (°T)	NEW MULTI. GOUGES	NUMBER OF INCIS.	DEEPEST INCISION (M)	DISRUPT WIDTH (M)	ø (°T)	COMMENTS
3.45	14.1				NL	<.2	2	<.2	94/94						
3.55	14.4				NL	<.2	2	<.2	101/101						
3.60	14.6									NL	2	<.2	8	142/142	
3.70	14.8				NL	<.2	2	<.2	132/132						
EF/4	15.0	9	9	100.											change template to 1:1.067
4.05	15.2				NL	<.2	2	<.2	112/112						
4.15	15.3				NL	<.2	2	<.2	115/115						
4.15	15.3				NL	<.2	1	<.2	130/130						
4.40	15.4				NL	<.2	1	<.2	139/139						
4.60	15.9				NL	<.2	6	<.2	142/142						Termination: 322°T
4.70	16.5				NL	NC	3	NC	161/161						Termination: 341°T
4.75	16.7				NL	<.2	2	<.2	159/159						
4.75	16.7				NL	<.2	1	<.2	150/150						Termination: 330°T
4.80	16.8				13	<.2	2	<.2	00/00						
FG/5	17.8	7	2	28.6											Begin adding 1.5 m to water depth measurements
5.20	18.8				NL	<.2	5	<.2	141/141						
5.25	18.9				NL	.2	5	<.2	113/113						
GH/6	20.5	70	5	7.1											
6.30	20.5				NL	<.2	2	<.2	104/104						
6.40	20.7									NL	4	.2	10	132/132	
HI/7	21.6	67	3	4.5											
7.20	22.0				NL	<.2	2	<.2	146/146						
7.65	22.6				NL	<.2	2	<.2	118/118						
7.80	22.7				NL	<.2	3	<.2	123/123						

TESTLINE: 3 **JULIAN DATE:** 250 **YEAR:** 1981-1982 **TEMPLATE IDENTIFICATION:** 1:1,067

TRACKLINE NUMBER: 12 **COURSE:** 000 °T.

					SINGLE GOUGES					MULTIPLET GOUGES					
SEGMENT	WATER DEPTH (M)	TOTAL GOUGES	TOTAL NEW GOUGES	%	Length NEW SINGLE GOUGES	GOUGE DEPTH (M)	GOUGE WIDTH (M)	RIDGE HEIGHT (M)	Ø (°T)	Length NEW MULTI. GOUGES	NUMBER OF INCIS.	DEEPEST INCISION (M)	DISRUPT WIDTH (M)	Ø (°T)	COMMENTS
IJ/8	22.4	87	0	0.0											Perfect record match.
JK/9	22.7	72	4	5.6											
9.90	22.4									NL	4	<.2	50	126/126	large unaffected areas between incisions.
KL/10	22.5	41	0	0.0											excellent record match.
LM/11	22.2	124	22	17.7											sonar missing at end of segment.
11.25	21.7									NL	14	.2	87	113/113	Pressure Ridge type scour.
11.30	21.4									NL	5	.2	18	117/117	
11.40	21.4				NL	.2	4	.6	107/107						
11.45	21.5									NL	8	<.2	25	142/142	
11.45	21.5									NL	2	.2	29	114/114	
11.55	21.6				NL	<.2	2	<.2	130/130						
11.55	21.6				NL	<.2	2	<.2	92/92						
MN/12	21.7	86	8	9.3											18m Bench just before Pt N. (4.2m drop).
12.60	21.2									NL	2	.3	22	126/126	Dodging ice makes comparisons difficult.
12.75	21.1									NL	4	.2	26	111/111	
12.80	20.9									NL	2	.2	23	101/101	
NO/13	21.0	268	134	50.0											Change in gouge character. Seafloor
13.01	21.0				NL	NC	7	NC	16/16						Saturated with gouges. Number of new gouges
13.10	23.3									NL	12	.4	52	114/114	is a conservative count.
13.15	23.5				NL	<.2	1	<.2	140/140						
13.15	23.5				NL	<.2	2	<.2	142/142						
13.20	23.8									NL	19	.2	47	140/140	
13.30	23.8									NL	8	.3	22	117/117	

TESTLINE: 3 **JULIAN DATE:** 250 **YEAR:** 1981-1982 **TEMPLATE IDENTIFICATION:** 1:1,067

TRACKLINE NUMBER: 12					Length	SINGLE GOUGES				Length	MULTIPLET GOUGES				COURSE: 000°T.
SEGMENT	WATER DEPTH (M)	TOTAL GOUGES	TOTAL NEW GOUGES	%	NEW SINGLE GOUGES	GOUGE DEPTH (M)	GOUGE WIDTH (M)	RIDGE HEIGHT (M)	Ø (°T)	NEW MULTI. GOUGES	NUMBER OF INCIS.	DEEPEST INCISION (M)	DISRUPT WIDTH (M)	Ø (°T)	COMMENTS
13.30	23.8				NL	.3	3	.4	139/139						
13.30	23.8				NL	.3	5	.4	107/107						
13.35	23.8				NL	.2	5	.2	109/109						
13.35	23.8									NL	10	.2	35	133/133	
13.45	23.8									NL	9	.7	57	117/117	
13.55	23.9									NL	18	.8	108	122/122	
13.60	24.0									NL	7	<.2	12	123/123	
13.70	24.2									NL	8	.2	50	123/123	
13.75	24.2									NL	2	NC	11	161/161	
13.75	23.2									NL	2	.5	14	146/146	
13.75	23.9									NL	4	.4	19	98/98	
13.80	24.0									NL	2	NC	12	102/102	
13.90	24.2									NL	27	.8	132	123/123	
OP/14	24.1														OFF LINE FOR 1/2 OF SEGMENT. CAN NOT MATCH BETWEEN RECORDS. PROBABLY LARGE NUMBER OF NEW GOUGES (AS IN Seg. 13)

TESTLINE: 4 **JULIAN DATE:** **YEAR:** 1977-1978 **TEMPLATE IDENTIFICATION:** 1:1.935

TRACKLINE NUMBER: 10,11

					Length SINGLE GOUGES					Length MULTIPLE GOUGES					CS: 027°T
SEGMENT	WATER DEPTH (M)	TOTAL GOUGES	TOTAL NEW GOUGES	%	NEW SINGLE GOUGES	GOUGE DEPTH (M)	GOUGE WIDTH (M)	RIDGE HEIGHT (M)	Ø (°T)	NEW MULTI. GOUGES	NUMBER OF INCIS.	DEEPEST INCISION (M)	DISRUPT WIDTH (M)	Ø (°T)	COMMENTS
AB/0		—	—	—											No Sonar this segment
															Sonar # 4 Bats # 7
BC/1	3.3	59	4	6.8											Better quality sonar than 1977 records. Strudel
1.01	3.3				NL	<.2	2	<.2	117/144						Scours at end of segment
1.70	4.9				NL	<.2	2	<.2	40/67						
1.85	5.0				NL	.3	8	<.2	44/71						
1.90	5.0				NL	NC	1	NC	152/179						
CD/2	5.3	36	6	15.4											
2.25	5.7				NL	.2	6	<.2	62/89						
2.30	5.8				NL	<.2	1	<.2	29/56						
2.65	6.3				NL	<.2	1	<.2	31/58						
2.70	6.5				NL	<.2	2	<.2	17/44						
2.85	6.7				48	NC	1	NC	32/59						
2.85	6.7				32	NC	2	NC	20/47						
DE/3	6.9	14	7	50.0											
3.15	6.8				17	NC	2	NC	133/160						
3.20	7.0				NL	.2	2	.2	138/165						
3.25	7.2				22	NC	4	NC	17/44						
3.65	7.7				NL	<.2	2	.2	98/125						
3.95	7.9									25	3	NC	10	22/49	
EF/4	8.0	27	4	14.8											Patches of funny bottom showing through (windows)
4.25	8.0				68	NC	1	NC	165/12						probably uncovered through movement of sand between
4.30	8.3				NL	<.2	1	<.2	39/66						years.
4.50	8.5				NL	<.2	5	<.2	141/168						
4.95	8.9				NL	<.2	3	<.2	99/126						

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TESTLINE: 4	JULIAN DATE:	YEAR: 1977-1978	TEMPLATE IDENTIFICATION: 1:1.935

TRACKLINE NUMBER: 10, 11					Length SINGLE GOUGES					Length MULTIPLE GOUGES					
SEGMENT	WATER DEPTH (M)	TOTAL GOUGES	TOTAL NEW GOUGES	%	NEW SINGLE GOUGES	GOUGE DEPTH (M)	GOUGE WIDTH (M)	RIDGE HEIGHT (M)	Ø (°T)	NEW MULTI. GOUGES	NUMBER OF INCIS.	DEEPEST INCISION (M)	DISRUPT WIDTH (M)	Ø (°T)	COMMENTS
															movement of sand has exposed more consolidated sediments that may contain older gouges
FG/5	8.8	15	4	26.7											many gouges on 1977 record are infilled - heavy bottom smoothing suggested.
5.30	9.2				NL	.2	4	<.2	60/87						
5.30	9.2				NL	<.2	2	<.2	52/79						
5.45	9.5				NL	NC	2	NC	167/14						
5.60	9.6				NL	.4	7	.4	116/143						
GH/6	9.8	29	6	20.7											bottom has been smoothed. all new gouges are very small.
6.10	9.7				25	NC	2	NC	38/65						all old gouges are infilled. shape = ∩ ← 38°T
6.40	10.1									65	2	<.2	7	19/46	
6.40	10.1				72	NC	2	NC	07/34						
6.50	10.3				50	NC	2	NC	35/62						
6.95	10.2				43	<.2	1	<.2	169/16						
HI/7	10.5	24	5	20.8											bottom smoothed - most old gouges totally infilled.
7.25	10.6									58	2	NC	14	15/42	
7.55	11.0				NL	.2	5	.2	118/145						
7.65	11.0				NL	<.2	1	<.2	10/37						
7.99	11.0				NL	NC	2	NC	51/78						continues into next segment.
IJ/8	11.0	47	4	8.5											older gouges infilled.
8.05	11.1				NL	<.2	2	<.2	51/78						
8.65	11.9									NL	3	<.2	15	122/149	Terminates direction - 149°T
JK/9	12.0	63	6	9.5											older gouges infilled.
9.05	11.9									NL	2	.2	15	130/157	
9.10	12.0				53	NC	3	NC	02/29						Terminates direction - 029°T

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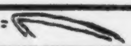
TESTLINE: 4 | **JULIAN DATE:** | **YEAR:** 1977-1978 | **TEMPLATE IDENTIFICATION:** 1:1.935

TRACKLINE NUMBER: 10,11

					Length SINGLE GOUGES					Length MULTIPLE GOUGES					
SEGMENT	WATER DEPTH (M)	TOTAL GOUGES	TOTAL NEW GOUGES	%	NEW SINGLE GOUGES	GOUGE DEPTH (M)	GOUGE WIDTH (M)	RIDGE HEIGHT (M)	ø (°T)	NEW MULTI. GOUGES	NUMBER OF INCIS.	DEEPEST INCISION (M)	DISRUPT WIDTH (M)	ø (°T)	COMMENTS
9.80	12.5									50	3	NC	17	35/62	
KL/10	12.6	117	11	9.4											seafloor smoothed in 1978.
10.10	12.6				NL	<.2	2	<.2	129/156						
10.20	12.9				NL	.2	4	.2	91/118						
10.30	12.9									NL	4	<.2	23	103/130	
10.35	13.0				NL	.2	2	<.2	20/47						
10.60	13.0				NL	<.2	1	<.2	65/92						
10.65	13.2									NL	2	.4	8	121/148	
10.75	12.9				NL	.2	3	<.2	131/158						
LM/11	13.4	120	24	20.0											
11.05	13.3									NL	9	.3	41	131/158	
11.10	13.5				NL	.2	2	<.2	111/138						
11.20	13.5									NL	2	.4	18	98/125	
11.55	13.6									NL	2	.3	12	95/122	
11.80	14.0									NL	5	<.2	25	51/78	
11.85	13.9									NL	5	.3	35	60/87	
MN/12	14.1	102	5	4.9											
12.05	14.0				NL	.2	3	<.2	66/93						
12.15	14.0				NL	<.2	2	<.2	113/140						
12.30	14.5				NL	<.2	2	<.2	72/99						
12.99	14.7				NL	NC	3	NC	18/45						Terminates direction - 225°T
12.99	14.7				28	NC	9	NC	126/153						
NO/13	14.7	127	19	15.0											
13.65	15.1				NL	NC	2	NC	69/96						Terminates direction - 276°T

TESTLINE: 4 | **JULIAN DATE:** | **YEAR:** 1977-1978 | **TEMPLATE IDENTIFICATION:** 1:1.935 :

TRACKLINE NUMBER: 10,11

					Length SINGLE GOUGES					Length MULTIPLE GOUGES					CS: 027°T
SEGMENT	WATER DEPTH (M)	TOTAL GOUGES	TOTAL NEW GOUGES	%	NEW SINGLE GOUGES	GOUGE DEPTH (M)	GOUGE WIDTH (M)	RIDGE HEIGHT (M)	Ø (°T)	NEW MULTI. GOUGES	NUMBER OF INCIS.	DEEPEST INCISION (M)	DISRUPT WIDTH (M)	Ø (°T)	COMMENTS
13.70	15.0				NL	.3	6	.7	74/101						
13.80	15.0				NL	.5	8	.4	90/117						
13.85	15.1									NL	4	.3	19	153/00	
13.95	15.2									NL	7	NC	39	152/179	
13.95	15.2									NL	5	NC	18	15/42	Terminates direction- 222°T
0P/14	15.2	245	98	40.0											Start line 11 Template I.D.: 1:1695
14.01	15.3									NL	5	NC	23	32/59	very heavy multiplet
14.05	15.5									NL	12	.5	45	152/179	scouring for entire
14.15	15.7									NL	4	.3	28	102/129	segment
14.20	15.7									NL	10	.5	39	148/175	
14.30	14.5									NL	6	1.2	16	146/173	*Change to Narrow
14.30	14.5									NL	5	.5	23	68/95	Beam Ducer may account for
14.40	14.5									NL	7	.8	18	123/150	bathymetry discrepancy
14.40	14.4									NL	8	.3	36	68/95	for rest of record.
14.45	14.5									NL	11	.3	42	115/142	
14.60	14.7				NL	.3	3	<.2	107/134						
14.70	14.7									NL	10	.6	36	119/146	
14.75	14.8									NL	7	.5	18	127/154	
14.85	14.7				NL	.3	4	.2	07/34						shape = 
14.90	14.7									NL	2	.5	13	120/147	
14.90	14.7									NL	2	.2	10	81/108	
14.90	14.9									NL	5	.3	30	127/154	
14.95	14.9									NL	2	.2	12	119/146	Continues into next seg.
PQ/15	15.0	157	45	28.7											
15.01	15.0									NL	2	.2	12	119/146	
15.05	14.2									NL	4	.5	27	120/147	

TESTLINE: 4	JULIAN DATE:	YEAR: 1977-1978	TEMPLATE IDENTIFICATION: 1:1,935

TRACKLINE NUMBER: 10,11					LENGTH SINGLE GOUGES					LENGTH MULTIPLE GOUGES					CS: 027°T
SEGMENT	WATER DEPTH (M)	TOTAL GOUGES	TOTAL NEW GOUGES	%	NEW SINGLE GOUGES	GOUGE DEPTH (M)	GOUGE WIDTH (M)	RIDGE HEIGHT (M)	Ø (°T)	NEW MULTI. GOUGES	NUMBER OF INCIS.	DEEPEST INCISION (M)	DISRUPT WIDTH (M)	Ø (°T)	COMMENTS
15.10	14.4				NL	.2	4	.3	77/104						
15.25	14.5									NL	16	.5	118	115/142	
15.35	14.6									NL	5	.3	16	110/137	
15.45	14.7									NL	12	.3	115	104/131	
15.50	14.8				NL	<.2	2	<.2	108/135						
15.55	15.0				NL	.2	5	<.2	110/137						
15.60	15.0				NL	.5	4	.4	112/139						
15.70	15.1				NL	.4	3	.3	74/101						
15.99	15.3				NL	.4	8	.5	104/131						continues into next segment.
QR/16	15.8	110	11	10.0											begin add .5m to fathogram - machine malfunction
16.01	15.8				NL	.4	8	.5	104/131						
16.15	15.9									NL	2	.3	17	80/107	
16.85	16.5				NL	.4	7	.3	97/124						
16.90	16.5									NL	3	.4	16	103/130	
16.99	16.6									NL	4	.3	70	106/133	continues into next segment.
RS/17	16.6	125	21	16.8											
17.01	16.6									NL	4	.3	70	106/133	
17.15	16.6				NL	.4	7	.5	102/129						
17.25	16.8				NL	.5	8	.4	95/122						
17.35	17.0									NL	3	.5	25	90/117	
17.40	17.1									NL	5	.5	32	100/127	
17.50	17.2				NL	.3	2	<.2	117/144						
17.55	17.3									NL	3	.2	15	117/144	
17.85	17.5									NL	3	.2	37	118/145	

TESTLINE: 4
JULIAN DATE:
YEAR: 1977-1978
TEMPLATE IDENTIFICATION: 1:1.935

TRACKLINE NUMBER: 10, 11					Length SINGLE GOUGES					Length MULTIPLE GOUGES					CS: 027°T
SEGMENT	WATER DEPTH (M)	TOTAL GOUGES	TOTAL NEW GOUGES	%	NEW SINGLE GOUGES	GOUGE DEPTH (M)	GOUGE WIDTH (M)	RIDGE HEIGHT (M)	Ø (°T)	NEW MULTI. GOUGES	NUMBER OF INCIS.	DEEPEST INCISION (M)	DISRUPT WIDTH (M)	Ø (°T)	COMMENTS
ST/18	17.5	127	13	10.2											
18.05	17.7				NL	.2	14	<.2	90/117						
18.20	17.6				45	NC	2	NC	75/102						
18.25	17.8				NL	.5	3	.2	110/137						
18.30	17.8				NL	.3	3	.2	110/137						
18.30	17.8				NL	.2	2	<.2	112/139						
18.75	18.0				NL	.3	12	.2	104/131						
18.85	18.0									NL	7	.3	23	142/169	
TU/19	18.2	97	0	0.0											many gouges appear reworked by hydralics
UV/20	18.7	120	6	5.0											hyrolic reworking indicated.
20.30	18.7									NL	3	.4	12	111/138	
20.40	18.8									NL	2	.4	17	99/126	
20.60	18.8				NL	.3	3	.4	114/141						
VW/21	19.0	117	7	6.0											hydrolic reworking indicated
21.30	19.1									NL	2	NC	12	133/160	Termination: 340°T Discontinuous
21.30	19.1									NL	3	.3	16	136/163	Termination: 343°T
21.30	19.1				NL	NC	3	NC	136/163						Discontinuous
21.35	19.1				NL	NC	2	NC	136/163						
WX/22	19.3	93	2	2.1											SLIGHTLY WEST OF LINE. hydrolic reworking
22.80	19.6									NL	2	1.2	13	108/135	
XY/23	19.6	97	0	0.0											hyrodic reworking (on line)

TESTLINE: 4 | **JULIAN DATE:** | **YEAR:** 1977-1978 | **TEMPLATE IDENTIFICATION:** 1: 1.935

TRACKLINE NUMBER: 10,11					Length SINGLE GOUGES					Length MULTIPLE GOUGES					CS: 027°T
SEGMENT	WATER DEPTH (M)	TOTAL GOUGES	TOTAL NEW GOUGES	%	NEW SINGLE GOUGES	GOUGE DEPTH (M)	GOUGE WIDTH (M)	RIDGE HEIGHT (M)	Ø (°T)	NEW MULTI. GOUGES	NUMBER OF INCIS.	DEEPEST INCISION (M)	DISRUPT WIDTH (M)	Ø (°T)	COMMENTS
YZ/24	19.9	112	6	5.4											
24.75	19.9									NL	3	NC	11	33/60	Termination: 240°T
24.90	19.6				NL	NC	4	NC	62/89						Termination : 269°T
24.90	19.6									55	2	NC	13	130/157	Termination : 157°T
ZAA/25	19.7	148	5	3.4											Large pressure ridge gouge in segment.
25.55	19.8									NL	2	<.2	12	92/119	
25.60	19.8									NL	3	.3	27	97/124	
AABB/26	19.7	188	5	2.7											west of line. Bottom coming up. Many wide
26.50	19.2									NL	5	.5	28	94/121	presseure ridge gouges
BBCC/27	18.5														West of line. Unable to correlate older gouges on record. Appears as though many new gouges have been formed on offshore shoal.

TESTLINE: 4 | **JULIAN DATE:** 219 | **YEAR:** 1978-1980 | **TEMPLATE IDENTIFICATION:** 1:1.633

TRACKLINE NUMBER: 20					Length SINGLE GOUGES					Length MULTIPLE GOUGES					CS: 027°T
SEGMENT	WATER DEPTH (M)	TOTAL GOUGES	TOTAL NEW GOUGES	%	NEW SINGLE GOUGES	GOUGE DEPTH (M)	GOUGE WIDTH (M)	RIDGE HEIGHT (M)	Ø (°T)	NEW MULTI. GOUGES	NUMBER OF INCIS.	DEEPEST INCISION (M)	DISRUPT WIDTH (M)	Ø (°T)	COMMENTS SS #7 Bots #74,15
AB/0	—	—													NO SONAR – NO BATHY.
BC/1	3.1	25	5	20.0											Bottom contains many reexposed gouges and causes difficulty in observing new ones.
1.15	3.3				NL	<.2	1	<.2	148/175						
1.50	4.0				NL	<.2	1	<.2	44/71						
1.60	4.2									NL	2	<.2	7	176/23	
1.80	4.8				NL	<.2	1	<.2	50/77						
CD/2	5.1	24	3	12.5											
2.05	5.2				NL	.2	5	.2	52/79						Termination Direction 259°T
2.40	5.9				NL	<.2	2	<.2	65/92						
2.50	6.0				NL	<.2	3	<.2	50/77						
															* sand waves on seafloor. Their shifting reexposes old gouges in troughs. Many gouges that are on 1978 record are gone (covered by sand) while many reexposed older gouges on 1980 record were not observed on the 1978 record. These old gouges have orientations of 90-80°T. Sand waves have period of 100-150 m with 20-40 m height. *
DE/3	6.6	23	0	0.0											
EF/4	7.6	18	4	22.2											
4.60	8.3				NL	<.2	1	<.2	136/163						
4.90	8.3									38	3	<.2	21	150/177	
FG/5	8.8	26	4	15.4											
5.20	8.7									NL	2	<.2	4	160/07	
5.30	9.0				NL	.4	5	.4	23/60						
5.35	9.0				NL	<.2	3	<.2	122/149						
GH/6	9.2	48	5	10.4											
6.80	10.4				NL	<.2	1	<.2	27/54						
6.90	10.3									NL	3	<.2	12	45/92	
6.95	10.2				50	NC	2	NC	16/43						

TESTLINE: 4	JULIAN DATE: 219	YEAR: 1978-1980	TEMPLATE IDENTIFICATION: 1:1.633

TRACKLINE NUMBER: 20					Length SINGLE GOUGES					Length MULTIPLE GOUGES					CS: 027°T
SEGMENT	WATER DEPTH (M)	TOTAL GOUGES	TOTAL NEW GOUGES	%	NEW SINGLE GOUGES	GOUGE DEPTH (M)	GOUGE WIDTH (M)	RIDGE HEIGHT (M)	Ø (°T)	NEW MULTI. GOUGES	NUMBER OF INCIS.	DEEPEST INCISION (M)	DISRUPT WIDTH (M)	Ø (°T)	COMMENTS
HI/7	10.5	29	9	31.0											
7.05	10.5				77	NC	3	NC	—						) SEMI-CIRCULAR
7.40	10.5				NL	NC	3	NC	123/150						MOST OF THE NEW GOUGES ARE IN THE SAND WAVE AREAS (CRESTS AND SIDES).
7.40	10.5				NL	<.2	1	<.2	109/136						
7.80	10.8				NL	<.2	2	<.2	120/147						
7.85	10.9				NL	<.2	2	<.2	67/94						
7.90	11.0									NL	3	<.2	7	178/25	
7.95	11.0				NL	<.2	1	<.2	145/172						
IJ/8	11.1	—	—												OFF LINE.
JK/9	12.0	—	—												OFF LINE.
KL/10	12.6	157	52	33.1											
10.05	12.5									NL	5	.3	23	18/45	
10.05	12.5									NL	7	<.2	30	50/77	
10.20	12.6									NL	6	.2	38	52/79	
10.30	12.9									NL	2	NC	6	30/57	
10.35	12.9									NL	2	<.2	11	28/55	
10.50	13.0									NL	2	.2	9	35/62	
10.50	13.0									NL	2	.5	20	110/137	
10.70	13.1				NL	.2	5	<.2	43/70						
10.70	13.1				NL	<.2	6	<.2	35/62						
10.75	13.1									NL	21	.2	53	163/10	
10.80	13.0				NL	.3	7	.4	104/131						
10.85	13.1				NL	.2	6	<.2	100/127						
10.95	13.2				NL	.2	2	<.2	26/53						

TESTLINE: 4 | **JULIAN DATE:** 219 | **YEAR:** 1978-1980 | **TEMPLATE IDENTIFICATION:** 1:1.633

TRACKLINE NUMBER: 20

					Length SINGLE GOUGES					Length MULTIPLE GOUGES					CS: 027°T
SEGMENT	WATER DEPTH (M)	TOTAL GOUGES	TOTAL NEW GOUGES	%	NEW SINGLE GOUGES	GOUGE DEPTH (M)	GOUGE WIDTH (M)	RIDGE HEIGHT (M)	Ø (°T)	NEW MULTI. GOUGES	NUMBER OF INCIS.	DEEPEST INCISION (M)	DISRUPT WIDTH (M)	Ø (°T)	COMMENTS
LM/11	13.2	111	20	18.0											
11.25	13.4				NL	<.2	1	<.2	14/41						
11.40	13.5				NL	.4	2	.5	71/98						
11.40	13.5									NL	2	NC	7	164/11	Termination: 191°T
11.60	13.7									NL	15	.3	62	32/59	
11.85	13.9				NL	.6	3	.7	98/125						
MN/12	14.0	64	10	15.6											
12.15	14.0									NL	2	.2	15	42/69	
12.35	14.2				NL	.3	2	.2	122/149						
12.35	14.2				NL	.5	5	.5	38/65						
12.50	14.3				NL	.5	13	.7	82/109						
12.80	14.5				NL	.4	11	.8	95/122						
12.90	14.6									NL	2	.4	17	142/169	
12.90	14.6				NL	.4	5	.4	42/69						
12.95	14.6				NL	.3	11	.4	48/75						
NO/13	14.7	149	21	14.1											OFF LINE AT BEGINING OF SEGMENT.
13.25	14.9				NL	.2	2	.3	38/65						
13.65	15.1									NL	7	<.2	35	138/165	
13.70	15.1									NL	6	<.2	25	134/161	
13.70	15.1				NL	<.2	2	<.2	96/123						
13.70	15.1				NL	.3	2	<.2	62/89						
13.80	15.1				NL	<.2	2	<.2	71/98						
13.80	15.1				NL	<.2	2	<.2	56/83						
13.85	15.2				NL	<.2	2	<.2	50/77						
13.85	15.2									NL	2	.4	16	74/101	

TESTLINE: 4 **JULIAN DATE:** 219 **YEAR:** 1978-1980 **TEMPLATE IDENTIFICATION:** 1:1.633

TRACKLINE NUMBER: 20

CS: 027°T

					Length SINGLE GOUGES					Length MULTIPLE GOUGES					
SEGMENT	WATER DEPTH (M)	TOTAL GOUGES	TOTAL NEW GOUGES	%	NEW SINGLE GOUGES	GOUGE DEPTH (M)	GOUGE WIDTH (M)	RIDGE HEIGHT (M)	Ø (°T)	NEW MULTI. GOUGES	NUMBER OF INCIS.	DEEPEST INCISION (M)	DISRUPT WIDTH (M)	Ø (°T)	COMMENTS
OP/14	15.2	122	31	25.4											OFF LINE LAST PART OF SEGMENT
14.01	15.1									NL	4	.8	35	30/57	
14.10	15.3				NL	.4	2	.2	113/140						
14.15	15.2				NL	.3	3	.3	79/106						
14.15	15.2				NL	.6	3	.3	84/111						
14.25	15.2				NL	.7	25	.9	90/117						
14.30	15.3				NL	.2	2	.4	101/128						
14.30	15.3				NL	.2	2	.3	102/129						
14.30	15.3				NL	.3	3	.3	102/129						
14.35	15.5									NL	4	.4	37	90/117	
14.40	15.5									NL	3	.5	36	153/00	
14.50	15.3				NL	.5	5	.2	42/69						
14.55	15.4									NL	5	.2	20	87/114	
14.60	15.3				NL	.3	3	.2	91/118						
14.60	15.3				NL	<.2	2	<.2	111/138						
14.60	15.3				NL	.5	3	.3	100/127						
14.70	15.5				NL	.5	3	.3	94/121						
14.70	15.4				NL	.3	2	<.2	86/113						
14.75	15.5				NL	.3	4	.2	78/105						
14.80	15.5				NL	.2	5	.2	74/101						
PQ/15	15.6	—	—												OFF LINE - TURNS FOR ICE
QR/16	16.6	—	—												OFF LINE - TURNS FOR ICE
R/end	—														No Fathogram.

TESTLINE: 4 **JULIAN DATE:** 239 **YEAR:** 1980-1982 **TEMPLATE IDENTIFICATION:** 1:1.935

TRACKLINE NUMBER: 4 **CS:** 027°T

SEGMENT	WATER DEPTH (M)	TOTAL GOUGES	TOTAL NEW GOUGES	%	Length SINGLE GOUGES NEW SINGLE GOUGES	GOUGE DEPTH (M)	GOUGE WIDTH (M)	RIDGE HEIGHT (M)	Ø (°T)	Length MULTIPLE GOUGES NEW MULTI. GOUGES	NUMBER OF INCIS.	DEEPEST INCISION (M)	DISRUPT WIDTH (M)	Ø (°T)	COMMENTS SS#2 Bats#2
AB/0	—	—	—	-											SONAR RESOLUTION POOR. SEGMENT LENGTH CONDENSED DUE TO HIGHER SHIP SPEEP.
BC/1	—	—	—	-											No SONAR FOR FIRST TWO SEGMENTS.
CD/2	5.0	39	0	0.0											Range on Sonar resolution only 75m on each side. MANY OF 1978 GOUGES SEEN.
DE/3	6.8	19	0	0.0											Fathogram reads 1 m TOO SHALLOW - add 1 m SONAR VERY POOR.
EF/4	7.8	24	3	12.5											
4.40	7.8				NL	<.2	2	<.2	50/77						
4.45	7.9				NL	<.2	1	<.2	22/49						
4.50	8.0				NL	<.2	2	<.2	125/152						
FG/5	8.5	29	1	3.4											sand waves. UNKNOWN SCOUR MARKS AT PT. F.
5.05	8.6				NL	<.2	3	<.2	56/83						
GH/6	9.5	33	1	3.0											
6.25	9.6				NL	<.2	4	.2	147/174						
HI/7	10.3	16	6	37.5											Poor Sonar limits total gouge count.
7.01	10.3				NL	NC	4	NC	21/48						21 ∨ 09
7.45	10.4				NL	<.2	2	<.2	64/91						
7.60	10.7				NL	.2	3	.2	66/93						
7.75	10.7				NL	<.2	2	<.2	113/140						
7.95	10.9				NL	.2	2	.2	117/144						
7.99	11.0				NL	.2	3	<.2	115/142						
IJ/8	11.0	—	—	-											NO 1980 SONAR COVERAGE

TESTLINE: 4 | **JULIAN DATE:** 239 | **YEAR:** 1980-1982 | **TEMPLATE IDENTIFICATION:** 1:1.935

TRACKLINE NUMBER: 4					Length SINGLE GOUGES					Length MULTIPLE GOUGES					CS: 027°T
SEGMENT	WATER DEPTH (M)	TOTAL GOUGES	TOTAL NEW GOUGES	%	NEW SINGLE GOUGES	GOUGE DEPTH (M)	GOUGE WIDTH (M)	RIDGE HEIGHT (M)	ø (°T)	NEW MULTI. GOUGES	NUMBER OF INCIS.	DEEPEST INCISION (M)	DISRUPT WIDTH (M)	ø (°T)	COMMENTS
JK/9	11.6	—	—	–											NO 1980 SONAR COVER.
KL/10	12.3	93	8	8.6											
10.30	12.5				NL	.3	3	.2	90/117						
10.35	12.6				NL	.2	3	<.2	30/57						
10.50	12.7				NL	.6	3	.9	100/117						
10.50	12.7				NL	.2	2	.2	66/93						
10.70	12.5				NL	.9	3	.6	95/122						
10.70	12.5									NL	2	.6	13	57/84	
10.80	12.7				NL	.7	10	.9	66/93						
LM/11	12.8	75	13	17.3											
11.15	13.0									NL	4	.2	14	28/55	
11.15	13.0				NL	.4	3	.2	103/130						
11.40	13.5									NL	4	.6	30	32/59	
11.50	13.5				NL	.5	3	.8	32/59						
11.60	13.6									NL	2	.5	18	75/102	
11.70	13.7				NL	NC	5	NC	16/53						
MN/12	14.0	58	8	13.8											
12.20	14.0									NL	4	.5	16	08/35	continues into next seg.- runs entire length of seg.
12.50	14.2									NL	2	.5	30	110/137	
12.55	—									NL	2	NC	15	12/39	NO FATHOGRAM
NO/13	—	104	17	16.3											NO FATHOGRAM AT PT. N.
13.01	—									NL	4	.5	16	08/35	from 12.20 seg.
13.01	—									NL	2	—	16	47/74	NO FATHOGRAM
13.01	—				NL	—	9	—	95/122						NO FATHOGRAM

TESTLINE: 4 | **JULIAN DATE:** 239 | **YEAR:** 1980-1982 | **TEMPLATE IDENTIFICATION:** 1: 1.935

TRACKLINE NUMBER: 4					Length	SINGLE GOUGES				Length	MULTIPLET GOUGES				COURSE: 027°T
SEGMENT	WATER DEPTH (M)	TOTAL GOUGES	TOTAL NEW GOUGES	%	NEW SINGLE GOUGES	GOUGE DEPTH (M)	GOUGE WIDTH (M)	RIDGE HEIGHT (M)	Ø (°T)	NEW MULTI. GOUGES	NUMBER OF INCIS.	DEEPEST INCISION (M)	DISRUPT WIDTH (M)	Ø (°T)	COMMENTS
13.15	—				NL	—	17	—	83/110						No FATHOGRAM
13.30	—				NL	—	2	—	37/64						No FATHOGRAM
13.50	14.7				NL	<.2	2	<.2	45/72						
13.75	14.9									NL	2	.6	22	100/127	
13.75	14.9				NL	.2	6	.4	55/82						
13.90	14.8				NL	.6	8	.9	78/105						
13.99	14.7									NL	3	.9	25	61/88	continues into next segment.
OP/14	14.7	102	19	18.6											
14.01	14.7									NL	3	.9	25	61/88	
14.15	14.9				NL	.5	8	.3	14/41						
14.20	15.0									NL	9	.2	55	80/107	
14.40	15.1									NL	3	.5	36	80/107	
14.45	15.1				NL	.6	6	.4	48/75						
14.50	15.2				NL	.3	3	.4	100/127						
14.55	15.2				NL	.6	5	.3	55/82						
P/end	15.6														end of

TESTLINE: 5

JULIAN DATE:

YEAR: 1979-1980

TEMPLATE IDENTIFICATION: 1: 1.633

TRACKLINE NUMBER: 25

COURSE: 006°T.

					Length	SINGLE GOUGES				Length	MULTIPLET GOUGES				
SEGMENT	WATER DEPTH (M)	TOTAL GOUGES	TOTAL NEW GOUGES	%	NEW SINGLE GOUGES	GOUGE DEPTH (M)	GOUGE WIDTH (M)	RIDGE HEIGHT (M)	Ø (°T)	NEW MULTi. GOUGES	NUMBER OF INCIS.	DEEPEST INCISION (M)	DISRUPT WIDTH (M)	Ø (°T)	COMMENTS SS# 9 Bats# 17
AB/0	3.8	3	1	33.3											Comparison of FATHOGRAMS SHOW THAT EXTENSIVE SEDIMENT
0.35	5.0				65	<.2	1	<.2	30/36						MOVEMENT TOOK PLACE BETWEEN RECORD YEARS. MANY BOULDERS
															on seafloor
BC/1	9.2	0	0	0.0											SEDIMENT RIPPLES θ=174°T λ=2m
															many boulders on seafloor.
CD/2	11.1	12	12	100											Boulders end shoreside of shoal. gouges associated with shoal.
2.80	12.5				NL	<.2	2	<.2	132/138						Shoal near pt. D is now 1.5m high (was 1.2m in 1979)
2.80	12.5									NL	4	<.2	13	130/136	Change template 1:1.067
2.80	12.5				18	<.2	2	<.2	123/129						Shoal has become more rounded.
2.80	12.5									NL	2	<.2	5	07/13	
2.85	13.9				NL	<.2	2	<.2	168/174						
2.85	13.9				18	<.2	1	<.2	145/151						
2.85	13.9				26	<.2	1	<.2	123/129						
2.90	14.4				NL	<.2	1	<.2	109/115						
DE/3	14.5	12	12	100											SEDIMENT RIPPLES θ=004°T λ=1m
3.05	14.6									NL	12	NC	25	16/22	Change template to 1:1.633
EF/4	16.0	—	—												OFF LINE FOR MOST OF SEGMENT.
F/end	18.9														

TESTLINE: 6 **JULIAN DATE:** 222 **YEAR:** 1979-1980 **TEMPLATE IDENTIFICATION:** 1:1,379

TRACKLINE NUMBER: 24

COURSE: 028°T

SEGMENT	WATER DEPTH (M)	TOTAL GOUGES	TOTAL NEW GOUGES	%	SINGLE GOUGES: Length NEW SINGLE GOUGES	GOUGE DEPTH (M)	GOUGE WIDTH (M)	RIDGE HEIGHT (M)	Ø (°T)	MULTIPLET GOUGES: Length NEW MULTI. GOUGES	NUMBER OF INCIS.	DEEPEST INCISION (M)	DISRUPT WIDTH (M)	Ø (°T)	COMMENTS 55th 9 Bots #17
AB/0	5.3	4	—												Bottom covered with boulders – NOT OBSERVED
															on 1979 RECORD NO 1979 RECORD UNTIL
BC/1	8.0	26	—												POINT E.
CD/2	9.5	23	—												
DE/3	10.1	21	—												
EF/4	11.1	29	3	10.3											Boulders on seafloor.
4.05					NL	<.2	1	<.2	56/84						
4.20					NL	<.2	5	<.2	40/68						
4.50					NL	<.2	3	<.2	47/75						
FG/5	12.0	34	—												OVER 1/2 OF 1979 SONAR MISSING.
GH/6	13.6	13	5	38.5											
6.20	13.8									NL	2	NC	8	24/52	
6.30	13.9				NL	<.2	2	<.2	43/71						
6.30	13.9				NL	NC	3	NC	173/21						
6.70	14.5				NL	<.2	1	<.2	120/198						
HI/7	14.5	14	4	28.6											
7.45	15.0									NL	2	<.2	3	175/23	
7.65	15.1				NL	<.2	2	<.2	41/69						
7.70	15.3				NL	NC	2	NC	21/49						49 ⁀ 13
I/end	15.9														

TESTLINE: 6 **JULIAN DATE:** 210 **YEAR:** 1980-1981 **TEMPLATE IDENTIFICATION:** 1:1.379

TRACKLINE NUMBER: 18

					Length SINGLE GOUGES					Length MULTIPLE GOUGES					CS: 028 °T
SEGMENT	WATER DEPTH (M)	TOTAL GOUGES	TOTAL NEW GOUGES	%	NEW SINGLE GOUGES	GOUGE DEPTH (M)	GOUGE WIDTH (M)	RIDGE HEIGHT (M)	Ø (°T)	NEW MULTI. GOUGES	NUMBER OF INCIS.	DEEPEST INCISION (M)	DISRUPT WIDTH (M)	Ø (°T)	COMMENTS SS# 10 Bats# 13
AB/0	5.7	0	0	0.0											Boulders of 1980 RECORD ARE covered by sediment.
															sonar resolution VERY POOR. .5m correction to waterdepth.
BC/1	8.2	25	0	0.0											change template - 1:1.633
CD/2	9.6	25	2	8.0											Sonar quality poor. change template - 1: 2.884
2.70	10.1				NL	<.2	1	<.2	43/71						
2.85	10.3				NL	<.2	1	<.2	35/63						
DE/3	10.5	38	5	13.2											Poor quality sonar. change template - 1:1.633
3.40	10.6				NL	<.2	1	<.2	58/						
3.90	11.1									NL	4	<.2	15	155/03	
EF/4	11.2	36	1	2.8											
4.50	11.8				NL	NC	2	NC	04/32						
FG/5	12.3	26	2	7.7											
5.35	12.9				NL	<.2	2	<.2	47/75						
5.65	13.3				NL	<.2	1	<.2	13/41						
GH/6	13.5	16	0	0.0											sonar quality poor.
HI/7	14.5	14	0	0.0											
I/end	15.8														

TESTLINE: 6 | **JULIAN DATE:** 244 | **YEAR:** 1981-1982 | **TEMPLATE IDENTIFICATION:** 1:1.379

TRACKLINE NUMBER: 6					Length SINGLE GOUGES					Length MULTIPLE GOUGES					CS: 028°T
SEGMENT	WATER DEPTH (M)	TOTAL GOUGES	TOTAL NEW GOUGES	%	NEW SINGLE GOUGES	GOUGE DEPTH (M)	GOUGE WIDTH (M)	RIDGE HEIGHT (M)	Ø (°T)	NEW MULTI. GOUGES	NUMBER OF INCIS.	DEEPEST INCISION (M)	DISRUPT WIDTH (M)	Ø (°T)	COMMENTS SS# 3 Dats# 3
AB/0	5.3	4	1	25.0											Boulders cover seafloor. Resolution better than 1981
0.80	7.5				NL	<.2	2	<.2	27/55						record. Total gouge counts may be higher
BC/1	7.8	46	5	10.9											Excellent resolution accounts for greater total gouge count.
1.55	8.2				NL	.7	2	.3	37/65						change template - 1:1.860
1.90	8.6				NL	<.2	2	<.2	38/66						
1.90	8.6									NL	3	<.2	10	08/36	36
															Fathogram beginning to give too shallow of a
CD/2	9.3	54	1	1.9											measurement. Begin adding .5m to water depth.
2.45	9.6				NL	.5	3	.4	18/46						change template - 1:2.884
DE/3	10.0	36	0	0.0											
EF/4	11.0	51	1	2.0											change template - 1:1.860
4.25	11.0				NL	NC	5	NC	23/51						Termination direction: 51°T
FG/5	11.8	55	18	32.7											Boulders still seen on sonar. Change template -
5.10	11.6									30	8	<.2	40	06/34	1:1.867
5.75	12.6				17	<.2	5	<.2	13/41						
5.85	12.7									37	7	<.2	32	04/32	
5.90	12.9				NL	<.2	2	<.2	30/58						
5.90	12.9				NL	<.2	2	<.2	32/60						
GH/6	13.5	20	1	5.0											Scale change on fathogram causes 1m discrepancy.
6.95	14.5				NL	NC	1	NC	166/14						add 1m to water depth.
HI/7	14.7	10	1	10.0											
7.01	14.7				NL	<.2	4	<.2	166/14						Change template 1:2.884

2

TESTLINE: 6	JULIAN DATE: 244	YEAR: 1981-1982	TEMPLATE IDENTIFICATION: 1:1.935

TRACKLINE NUMBER: 6					Length SINGLE GOUGES					Length MULTIPLE GOUGES					CS: 028°T
SEGMENT	WATER DEPTH (M)	TOTAL GOUGES	TOTAL NEW GOUGES	%	NEW SINGLE GOUGES	GOUGE DEPTH (M)	GOUGE WIDTH (M)	RIDGE HEIGHT (M)	Ø (°T)	NEW MULTI. GOUGES	NUMBER OF INCIS.	DEEPEST INCISION (M)	DISRUPT WIDTH (M)	Ø (°T)	COMMENTS
IJ/8	15.5	11	1	9.1											template change to above
8.50	15.8				NL	<.2	2	<.2	147/175						Termination direction - 355°T
JK/9	16.2	126	15	11.9											off course for last part of segment. Cross 18m
9.70	17.9									NL	15	NC	57	158/06	bench at 700m mark. template change - 1:1.379
KL/10	19.3	132	15	11.4											
10.15	20.2									NL	4	NC	10	18/46	
10.15	20.2				NL	NC	5	NC	36/64						
10.25	20.0									NL	8	NC	33	167/15	
10.40	20.2				NL	NC	3	NC	19/47						
10.90	21.6				NL	.2	2	<.2	52/80						
LM/11	21.7	125	0	0.0											
MN/12	23.2	133	6	4.5											
12.10	23.3									NL	4	.2	17	55/83	
12.35	23.8									NL	2	<.2	8	137/165	
NO/13	25.2	85	0	0.0											Excellent record match
OP/14	26.0	84	0	0.0											
PQ/15	26.5	98	1	1.0											
15.35	27.2				37	NC	5	NC	00/28						
															end of 1981 sonar
Q/end	27.4														

1012

TESTLINE: 7 | JULIAN DATE: | YEAR: 1981-1982 | TEMPLATE IDENTIFICATION: 1:1.633

TRACKLINE NUMBER: 8					Length SINGLE GOUGES					Length MULTIPLE GOUGES					CS : 000°T
SEGMENT	WATER DEPTH (M)	TOTAL GOUGES	TOTAL NEW GOUGES	%	NEW SINGLE GOUGES	GOUGE DEPTH (M)	GOUGE WIDTH (M)	RIDGE HEIGHT (M)	Ø (°T)	NEW MULTI. GOUGES	NUMBER OF INCIS.	DEEPEST INCISION (M)	DISRUPT WIDTH (M)	Ø (°T)	COMMENTS
AB/0	5.5	74	2	2.7											SS#4 Bots#5
• 0.50	6.3				NL	<.2	2	<.2	120/120						appears to be a 1m descrepency in bathymetry
• 0.55	6.4				NL	<.2	1	<.2	112/112						depth between the two records - machine malfunction?
															Resolution on this record is better; but is variable
BC/1	6.7	40	2	5.0											throughout.
1.01	6.7				NL	<.2	5	<.2	127/127						
1.80	7.0				50	NC	2	NC	147/147						
CD/2	7.1	42	2	4.8											
2.55	7.3				NL	<.2	1.	<.2	145/138						Gouges do not cross under ship but are very small
• 2.70	7.3				NL	<.2	2	<.2	138/138						
DE/3	7.4	79	7	8.9											
3.01	7.4				55	<.2	1	<.2	158/158						
3.01	7.4				NL	<.2	1	<.2	91/91						
3.05	7.5				NL	<.2	2	<.2	130/130						
3.10	7.5				NL	<.2	3	<.2	91/91						
3.40	7.7				NL	<.2	1	<.2	49/49						
3.95	8.2									NL	2	<.2	10	116/116	
EF/4	8.2	44	2	4.5											TEMPLATE CHANGE: 1:1.379
4.40	8.5				NL	<.2	2	<.2	60/60						
4.45	8.5				NL	NC	2	NC	52/52						
FG/5	9.0	68	15	22.1											
5.25	9.1									NL	3	<.2	7	44/44	
5.30	9.1									NL	2	<.2	13	113/113	
5.40	9.2				NL	<.2	2	<.2	58/58						

TESTLINE: 7			**JULIAN DATE:**			**YEAR:** 1981-1982				**TEMPLATE IDENTIFICATION:** 1:1.379					
TRACKLINE NUMBER: 8					Length **SINGLE GOUGES**					Length **MULTIPLE GOUGES**					CS: 000°T
SEGMENT	**WATER DEPTH (M)**	**TOTAL GOUGES**	**TOTAL NEW GOUGES**	**%**	**NEW SINGLE GOUGES**	**GOUGE DEPTH (M)**	**GOUGE WIDTH (M)**	**RIDGE HEIGHT (M)**	**Ø (°T)**	**NEW MULTI. GOUGES**	**NUMBER OF INCIS.**	**DEEPEST INCISION (M)**	**DISRUPT WIDTH (M)**	**Ø (°T)**	**COMMENTS**
5.40	9.2				NL	<.2	1	<.2	75/75						
5.40	9.2				NL	<.2	2	<.2	26/26						
5.45	9.2									NL	2	<.2	11	120/120	
5.50	9.3				NL	NC	3	NC	22/22						curvilinear shape 22 ⌣ 170
5.55	9.3				NL	<.2	1	<.2	45/45						
5.60	9.3				NL	.2	3	.3	70/70						Tick marks in trough.
5.80	9.4				NL	<.2	2	<.2	62/62						
5.99	9.5				NL	NC	1	NC	156/156						Curvilinear shape (con't into next segment) 156 ∧ 13
SH/6	9.5	56	8	14.3											
6.01	9.5				NL	NC	1	NC	13/13						(con't from 5.95)
6.20	9.6				NL	<.2	2	<.2	167/167						
6.35	9.8				NL	<.2	1	<.2	50/50						
6.50	9.9				NL	<.2	1	<.2	15/15						
6.55	9.9				NL	<.2	1	<.2	23/23						
6.70	10.0				NL	<.2	1	<.2	14/14						Termination: 194°T
6.75	10.0				NL	<.2	2	<.2	127/127						
6.95	10.2									NL	2	.2	19	72/72	
HL/7	10.2	79	8	10.1											
7.05	10.2									NL	2	.2	17	76/76	
7.15	10.3									NL	2	.3	13	73/73	
7.20	10.4				NL	<.2	1	<.2	50/50						
7.30	10.4				NL	<.2	2	<.2	48/48						bend in gouge 48 ∨ 130
7.35	10.4				NL	<.2	3	<.2	113/113						
7.35	10.4				NL	<.2	2	<.2	78/78						

TESTLINE: 7					JULIAN DATE:			YEAR: 1981-1982			TEMPLATE IDENTIFICATION: 1: 1.379 :				
TRACKLINE NUMBER: 8					Length SINGLE GOUGES					Length MULTIPLE GOUGES					CS: 000°T
SEGMENT	WATER DEPTH (M)	TOTAL GOUGES	TOTAL NEW GOUGES	%	NEW SINGLE GOUGES	GOUGE DEPTH (M)	GOUGE WIDTH (M)	RIDGE HEIGHT (M)	Ø (°T)	NEW MULTI. GOUGES	NUMBER OF INCIS.	DEEPEST INCISION (M)	DISRUPT WIDTH (M)	Ø (°T)	COMMENTS
IJ/8	10.8	40	4	10.0											
8.50	11.3				130	<.2	1	<.2	169/169						
8.80	11.5									52	2	NC	10	00/00	
8.95	11.7				NL	<.2	2	<.2	95/95						
JK/9	11.7	47	9	19.1											
9.25	12.0				NL	<.2	2	<.2	58/58						
9.40	12.1				NL	<.2	2	<.2	62/62						
9.55	12.3				NL	<.2	1	<.2	26/26						
9.70	12.3									NL	3	<.2	23	118/118	
9.99	12.5				NL	<.2	2	<.2	143/143						
9.99	12.5				NL	<.2	3	<.2	146/146						} continue into next segment
9.99	12.5				NL	NC	2	NC	09/09						
KL/10	12.5	56	14	25.0											
10.01	12.5				NL	<.2	2	<.2	143/143						
10.01	12.5				NL	<.2	3	<.2	146/146						} from previous segment.
10.01	12.5				NL	NC	2	NC	09/09						
10.45	12.7				NL	<.2	2	<.2	66/66						
10.50	12.7				NL	<.2	2	<.2	35/35						
10.85	12.8									NL	3	<.2	6	24/24	Terminates: 24°T
10.90	12.8				NL	NC	3	NC	22/22						bend in shape 22 167
10.90	12.8				NL	NC	2	NC	—						Circular ◎
10.95	12.9				NL	<.2	1	<.2	167/167						
10.99	13.0				NL	<.2	1	<.2	161/161						
10.99	13.0				NL	NC	1	NC	163/163						
10.99	13.0				NL	NC	2	NC	165/165						Continues into next segment.

TESTLINE: 7 | **JULIAN DATE:** | **YEAR:** 1981-1982 | **TEMPLATE IDENTIFICATION:** 1:1.379

TRACKLINE NUMBER: 8

CS: 000°T

					Length SINGLE GOUGES					Length MULTIPLE GOUGES					
SEGMENT	WATER DEPTH (M)	TOTAL GOUGES	TOTAL NEW GOUGES	%	NEW SINGLE GOUGES	GOUGE DEPTH (M)	GOUGE WIDTH (M)	RIDGE HEIGHT (M)	Ø (°T)	NEW MULTI. GOUGES	NUMBER OF INCIS.	DEEPEST INCISION (M)	DISRUPT WIDTH (M)	Ø (°T)	COMMENTS
LM/11	13.0	82	23	28.0											ICE DETOUR IN MID SEGMENT; POSSIBLE LOW VALUE FOR NEW
11.01	13.0				NL	NC	2	NC	165/165						GOUGES. NOT SIGNIFICANT. CONT from last segment
11.05	13.0				NL	<.2	1	<.2	06/06						
11.05	13.0				62	<.2	2	<.2	20/20						
11.10	13.0				NL	<.2	2	<.2	06/06						
11.10	13.0				NL	<.2	1	<.2	120/120						
11.15	13.1				NL	<.2	2	<.2	27/27						
11.15	13.1				NL	<.2	2	<.2	171/171						
11.15	13.1									NL	2	<.2	5	164/164	
11.15	13.1				NL	NC	3	NC	172/172						
11.15	13.1				65	NC	3	NC	158/158						
11.15	13.1				68	NC	3	NC	158/158						
11.20	13.2									NL	2	<.2	11	07/07	
11.25	13.3				NL	<.2	2	<.2	148/148						
11.55	13.8				NL	<.2	1	<.2	178/178						
11.55	13.8				NL	<.2	1	<.2	178/178						
11.75	14.0				NL	<.2	2	<.2	140/140						
11.99	14.3				NL	NC	2	NC	164/164						TERMINATION · 344°T
11.99	14.3				NL	NC	3	NC	162/162						con't into next seg. Termination: 342°T
11.99	14.3				NL	NC	3	NC	162/162						con't. into next seg. Termination: 342°T
11.99	14.3									NL	2	<.2	8	135/135	cont into next seg
MN/12	14.3	156	15	9.6											
12.01	14.3				NL	NC	3	NC	162/162						
12.01	14.3				NL	NC	3	NC	162/162						
12.01	14.3									NL	2	<.2	8	135/135	
12.30	14.3									NL	3	.3	16	120/120	
12.50	14.5				NL	.2	3	<.2	91/91						

TESTLINE: 7 **JULIAN DATE:** **YEAR:** 1981-1982 **TEMPLATE IDENTIFICATION:** 1:1.379

TRACKLINE NUMBER:					Length SINGLE GOUGES					Length MULTIPLE GOUGES					CS: 000°T
SEGMENT	WATER DEPTH (M)	TOTAL GOUGES	TOTAL NEW GOUGES	%	NEW SINGLE GOUGES	GOUGE DEPTH (M)	GOUGE WIDTH (M)	RIDGE HEIGHT (M)	Ø (°T)	NEW MULTI. GOUGES	NUMBER OF INCIS.	DEEPEST INCISION (M)	DISRUPT WIDTH (M)	Ø (°T)	COMMENTS
12.70	14.6				NL	NC	3	NC	15/15						TERMINATION: 195°T
12.70	14.6				NL	,2	4	<.2	87/87						
12.85	14.8				NL	<.2	2	<.2	131/131						
12.90	14.7									NL	3	.2	22	135/135	
12.99	15.0				NL	<.2	2	<.2	138/138						continues into next segment
NO/13	15.0	141	9	6.4											ice detour at end of seg. New Gouge count may be low.
13.01	15.0				NL	<.2	2	<.2	138/138						
13.05	15.0				NL	<.2	2	<.2	139/139						
13.05	15.0				NL	<.2	2	<.2	145/145						
13.15	14.8				NL	,2	3	.4	109/109						
13.25	15.2				NL	<.2	3	.2	130/130						
13.30	15.3				50	NC	4	NC	105/105						Termination: 105°T
13.35	15.3				NL	<.2	2	<.2	153/153						
13.35	15.3				NL	<.2	2	<.2	148/148						
13.55	15.5				NL	.2	2	<.2	125/125						
OP/14	15.9	120	18	15.0											
14.05	15.8									NL	2	.2	8	120/120	
14.10	15.9				NL	.2	1	.2	105/105						
14.10	15.9				NL	.5	2	.2	125/125						
14.20	16.0				NL	.4	5	<.2	95/95						
14.20	16.0				NL	NC	2	NC	130/130						
14.25	16.1				NL	.3	1	<.2	111/111						
14.25	16.1									NL	2	.2	7	118/118	
14.25	16.1				NL	.2	2	.3	125/125						
14.25	16.1				NL	.2	2	.2	108/108						
14.30	16.2									NL	2	.2	22	130/130	

TESTLINE: 7 **JULIAN DATE:** **YEAR:** 1981-1982 **TEMPLATE IDENTIFICATION:** 1:1,379

TRACKLINE NUMBER:					**Length SINGLE GOUGES**					**Length MULTIPLE GOUGES**					**CS:** 000°T
SEGMENT	**WATER DEPTH (M)**	**TOTAL GOUGES**	**TOTAL NEW GOUGES**	**%**	**NEW SINGLE GOUGES**	**GOUGE DEPTH (M)**	**GOUGE WIDTH (M)**	**RIDGE HEIGHT (M)**	**Ø (°T)**	**NEW MULTI. GOUGES**	**NUMBER OF INCIS.**	**DEEPEST INCISION (M)**	**DISRUPT WIDTH (M)**	**Ø (°T)**	**COMMENTS**
14.45	16.2				NL	.5	3	.4	118/118						
14.55	16.3				NL	.5	3	<.2	106/106						
14.60	16.3				NL	.7	5	.4	103/103						
14.75	16.6									NL	2	.2	25	73/73	
PQ/15	16.8	103	12	11.7											
15.05	16.9				NL	.3	4	.2	94/94						
15.15	16.9				NL	<.2	3	<.2	96/96						
15.15	16.9				NL	<.2	3	<.2	88/88						
15.20	17.0				NL	.2	5	.3	92/92						
15.20	17.0				NL	<.2	3	<.2	121/121						
15.30	17.1									NL	2	.4	30	95/95	
15.35	17.2				NL	<.2	2	<.2	62/62						
15.40	17.3				NL	<.2	3	<.2	94/94						
15.45	17.3				NL	NC	2	NC	175/175						∿ odd shape
15.50	17.3				15	NC	2	NC	162/162						
15.50	17.3				12	NC	2	NC	158/158						
QR/16	17.7	85	1	1.2											
16.75	18.5				NL	<.2	2	<.2	46/46						
R/end	18.6														end of 1981 DATA

TESTLINE: 8 | JULIAN DATE: | YEAR: 1981-1982 | TEMPLATE IDENTIFICATION: 1:1.633

TRACKLINE NUMBER: 7

					Length SINGLE GOUGES					Length MULTIPLE GOUGES					CS: 006°T
SEGMENT	WATER DEPTH (M)	TOTAL GOUGES	TOTAL NEW GOUGES	%	NEW SINGLE GOUGES	GOUGE DEPTH (M)	GOUGE WIDTH (M)	RIDGE HEIGHT (M)	Ø (°T)	NEW MULTI. GOUGES	NUMBER OF INCIS.	DEEPEST INCISION (M)	DISRUPT WIDTH (M)	Ø (°T)	COMMENTS SS# 3 Bats# 4
AB/0	7.1	0	0	0.0											Sediment ripples and possible boulders
															Θ=155°T λ≈2.5 m
BC/1	10.6	0	0	0.0											Possible boulders- Machine malfunction: add
															.8 m to all depth measurements-
CD/2	11.9	16	12	75.0											sonar record less clear than 1981 record.
2.15	12.3									NL	2	<.2	17	160/166	Bathymetry (depth) seems far off for 1982 record
2.15	12.3				NL	<.2	1	<.2	133/139						
2.15	12.3				NL	<.2	2	<.2	148/154						
2.15	12.3				NL	<.2	1	<.2	157/163						
2.15	12.3				NL	<.2	1	<.2	148/154						
2.35	12.8									NL	5	<.2	28	04/10	
2.65	14.0				NL	<.2	2	<.2	127/133						
DE/3	14.1	60	1	1.7											Break in slope mid-seg.
3.45	14.5				NL	<.2	3	<.2	93/99						
EF/4	16.8	69	12	17.4											
4.30	17.8									NL	3	<.2	15	65/71	
4.40	17.9									NL	3	<.2	11	46/52	
4.70	18.8									NL	6	<.2	32	157/163	
FG/5	19.8	63	2	3.2											start adding fudge factor for depth at 1.5 m
5.05	19.8									NL	2	<.2	10	40/46	
GH/6	20.5	127	2	1.6											1.5 m bench at end of segment. Change
6.40	20.5				NL	<.2	3	<.2	45/51						in gouge character seaward at bench.
6.85	21.5				NL	<.2	2	<.2	20/26						con'ts into next segment

TESTLINE: 8 | **JULIAN DATE:** | **YEAR:** 1981-1982 | **TEMPLATE IDENTIFICATION:** 1:1.633

TRACKLINE NUMBER: 7

					Length SINGLE GOUGES					Length MULTIPLE GOUGES					CS: 006 °T
SEGMENT	WATER DEPTH (M)	TOTAL GOUGES	TOTAL NEW GOUGES	%	NEW SINGLE GOUGES	GOUGE DEPTH (M)	GOUGE WIDTH (M)	RIDGE HEIGHT (M)	Ø (°T)	NEW MULTI. GOUGES	NUMBER OF INCIS.	DEEPEST INCISION (M)	DISRUPT WIDTH (M)	Ø (°T)	COMMENTS
HI/7	22.5	167	4	2.4											Pt H is perfect match and bathymetry is still
7.01	22.5				NL	<.2	2	<.2	20/26						.5 m shallow on 1982 record. Start adding 2 m
7.50	23.2				NL	.3	2	<.2	33/39						to measurements
7.65	23.4				NL	<.2	2	<.2	45/51						
7.75	23.2				NL	.3	2	<.2	115/121						
IJ/8	24.3	130	1	0.8											Change in scale make depth 2.5 m shallow - add 2.5
8.99	25.8				NL	NC	3	NC	05/11						continues into next segment.
JK/9	25.8	129	5	3.9											
9.01	25.8				NL	NC	3	NC	05/11						
9.40	26.2									NL	4	.8	25	126/132	
KL/10	27.0	116	—												ice detours and high density gouging make
															new gouge counting impossible
L/end	27.7														

TESTLINE: 9 **JULIAN DATE:** 237 **YEAR:** 1978-1982 **TEMPLATE IDENTIFICATION:** 1:1.379

TRACKLINE NUMBER: 1 **COURSE:** 020 °T

SEGMENT	WATER DEPTH (M)	TOTAL GOUGES	TOTAL NEW GOUGES	%	SINGLE GOUGES: Length NEW SINGLE GOUGES	SINGLE GOUGES: GOUGE DEPTH (M)	SINGLE GOUGES: GOUGE WIDTH (M)	SINGLE GOUGES: RIDGE HEIGHT (M)	SINGLE GOUGES: ø (°T)	MULTIPLET GOUGES: Length NEW MULTI. GOUGES	MULTIPLET GOUGES: NUMBER OF INCIS.	MULTIPLET GOUGES: DEEPEST INCISION (M)	MULTIPLET GOUGES: DISRUPT WIDTH (M)	MULTIPLET GOUGES: ø (°T)	COMMENTS SS#1 Bats#1
AB/0	6.0	7	7	100											sonar quality poor. Swell conditions make bathymetry
0.10	6.1				NL	<.2	5	<.2	151/171						record very poor. Sand ripples mid-segment.
0.25	6.7				NL	<.2	1	<.2	145/165						Bats reads shallow by approx. .5 m (add to depth)
0.25	6.7				NL	<.2	2	<.2	145/165						
0.30	6.9				25	<.2	2	<.2	173/13						
0.35	6.3				17	<.2	2	<.2	10/30						
0.35	6.3				8	<.2	1	<.2	20/40						
0.50	7.1				30	<.2	2	<.2	165/05						
BC/1	7.7	10	10	100											change template to 1:1.067
1.40	7.9				NL	.3	4	.2	111/131						
1.50	8.0				10	<.2	2	<.2	65/85						
1.60	8.0				NL	<.2	1	<.2	40/60						
1.65	8.2				NL	<.2	2	<.2	90/110						
1.75	8.4				NL	.2	2	<.2	90/110						
1.90	8.5									NL	3	.2	32	88/108	
1.99	8.5									NL	2	NC	7	178/18	Continues into next segment.
CD/2	8.5	16	16	100											Change template to 1:1.379
2.01	8.5									NL	2	NC	7	178/18	
2.05	8.5				NL	.3	4	.4	90/110						
2.05	8.5				NL	.2	3	<.2	57/77						
2.15	8.6				NL	NC	4	NC	168/08						
2.20	8.7				NL	<.2	2	<.2	42/62						
2.20	8.7				NL	<.2	2	<.2	93/113						
2.20	8.7				NL	<.2	2	<.2	42/62						
2.60	9.0				NL	NC	3	NC	11/31						
2.60	9.0				NL	—	5	—	87/107						swell makes gouge depth impossible to measure.

TESTLINE: 9 **JULIAN DATE:** 237 **YEAR:** 1978-1982 **TEMPLATE IDENTIFICATION:** 1:1.379

TRACKLINE NUMBER: 1 **COURSE:** 020°T

					Length	SINGLE GOUGES				Length	MULTIPLET GOUGES				
SEGMENT	WATER DEPTH (M)	TOTAL GOUGES	TOTAL NEW GOUGES	%	NEW SINGLE GOUGES	GOUGE DEPTH (M)	GOUGE WIDTH (M)	RIDGE HEIGHT (M)	Ø (°T)	NEW MULTI. GOUGES	NUMBER OF INCIS.	DEEPEST INCISION (M)	DISRUPT WIDTH (M)	Ø (°T)	COMMENTS
2.65	9.0				NL	NC	5	NC	02/22						Termination: 202°T
2.80	9.2				NL	<.2	2	<.2	139/159						
2.80	9.2				NL	<.2	2	<.2	78/98						
2.85	9.2				NL	NC	8	NC	12/32						Termination 212°T
2.99	9.3				NL	.3	6	.2	16/35						Continues into next segment
2.99	9.3				NL	—	3	—	17/37						continues into next segment
															*
DE/3	9.3	1	1	100											SONAR AND FATHO. ARE HIGHLY AFFECTED BY LARGE
3.01	9.3				NL	.3	10	.2	15/35						SWELL CONDITIONS. THE SONAR RESOLUTION IS ALSO VERY POOR.
															FROM SEGMENT DE/3 ON ONLY LARGE GOUGES WILL
EF/4	10.0	10	7	70.0											BE MEASURED (5 m WIDE OR GREATER). NUMBERS WILL
4.20	10.2				NL	.3	5	.2	100/120						THEREFORE ONLY REFLECT THESE ICE GOUGE FEATURES
4.25	10.2				NL	NC	7	NC	170/10						
4.35	10.3				NL	.5	7	.5	46/66						
4.65	10.5				NL	—	5	—	95/115						unresolvable fatho.
4.75	10.7				NL	.6	6	.6	62/82						
4.99	10.8									NL	2	<.2	11	15/35	Continues into next segment.
FG/5	10.9	9	5	55.6											
5.01	10.9									NL	2	<.2	11	15/35	
5.40	11.0				NL	<.2	12	<.2	109/129						
5.75	11.4				NL	.5	5	.3	59/79						
5.99	11.7				NL	1.1	15	.9	17/37						continues into next segment.
GH/6	11.8	30	23	76.7											OF THE seven old gouges >5m 6 belong to a multiplet
6.01	11.8				NL	1.1	15	.9	17/37						Start adding 1m to
6.10	12.0									NL	2	<.2	10	62/82	water depth measure.

TESTLINE: 9 | JULIAN DATE: 237 | YEAR: 1978-1982 | TEMPLATE IDENTIFICATION: 1:1.379

TRACKLINE NUMBER: 1					Length	SINGLE GOUGES				Length	MULTIPLET GOUGES				COURSE: 020°T
SEGMENT	WATER DEPTH (M)	TOTAL GOUGES	TOTAL NEW GOUGES	%	NEW SINGLE GOUGES	GOUGE DEPTH (M)	GOUGE WIDTH (M)	RIDGE HEIGHT (M)	Ø (°T)	NEW MULTI. GOUGES	NUMBER OF INCIS.	DEEPEST INCISION (M)	DISRUPT WIDTH (M)	Ø (°T)	COMMENTS
6.40	11.9									NL	2	—	13	20/40	swell makes it impossible to resolve gouge depths
6.40	11.9				NL	—	5	—	60/80						
6.50	12.1									NL	6	.9	47	50/70	Terminates: 250°T
6.55	12.0									NL	6	.6	30	56/76	Terminates: ends at large (3m) shoal or moraine at mid segment.
6.70	12.1									NL	5	—	34	49/69	
															— — —
HI/7	12.4	19	18	94.7											
7.15	12.5				NL	.4	5	.2	128/148						
7.20	12.5				NL	—	5	—	62/82						
7.40	12.6				NL	NC	5	NC	38/58						
7.45	12.6				NL	—	8	—	111/131						
7.50	12.6									NL	6	NC	37	39/59	
7.55	12.8				NL	—	7	—	126/146						
7.70	12.8				NL	NC	25	NC	18/38						Terminates: 218°T
7.80	13.0									NL	4	.7	28	27/47	Terminates: 227°T
7.99	13.0									NL	2	—	13	24/44	continues into next segment.
IJ/8	13.0	13	12	92.3											
8.01	13.0									NL	2	—	13	24/44	
8.25	—									NL	3	—	25	53/73	Terminates: 253°T
8.45	13.2				NL	—	12	—	64/84						
8.50	13.1									NL	2	.7	24	67/87	
8.55	13.2				NL	.5	6	<.2	73/93						
8.80	13.5				NL	.3	8	.2	43/63						
8.90	13.3									NL	2	.9	37	62/82	

TESTLINE: 9 | JULIAN DATE: 237 | YEAR: 1978-1982 | TEMPLATE IDENTIFICATION: 1:1.379

TRACKLINE NUMBER: 1

					Length	SINGLE GOUGES				Length	MULTIPLET GOUGES				COURSE: 020°T
SEGMENT	WATER DEPTH (M)	TOTAL GOUGES	TOTAL NEW GOUGES	%	NEW SINGLE GOUGES	GOUGE DEPTH (M)	GOUGE WIDTH (M)	RIDGE HEIGHT (M)	Ø (°T)	NEW MULTI. GOUGES	NUMBER OF INCIS.	DEEPEST INCISION (M)	DISRUPT WIDTH (M)	Ø (°T)	COMMENTS
JK/9	13.5	9	2	22.2											
9, 35	14.0				NL	—	5	—	43/63						
9. 80	13.5				NL	—	13	—	171/11						
KL/10	14.0	16	11	68.8											
10. 40	14.4									NL	3	<.2	23	46/66	
10. 50	14.3				NL	.2	6	.2	140/160						
10. 65	14.4									NL	2	<.2	17	62/82	
10. 80	14.4									NL	5	<.2	35	04/24	
LM/11	14.6	13	4	30.8											
11. 15	14.7				NL	—	8	—	90/110						Poor fathogram
11. 70	15.1				NL	NC	12	NC	86/106						
11. 85	15.4									NL	2	NC	18	22/42	Termination: 222°T
MN/12	15.4	17	7	41.2											fathogram unusable for gouge depth measures.
12. 15	15.4				NL	—	12	—	30/50						
12. 15	15.4				NL	—	11	—	41/61						
12. 70	15.7				NL	—	6	—	00/20						sinuous but still ∥ to track
12. 85	16.0				NL	—	13	—	54/74						
12.95	16.2									NL	3	—	19	40/60	
NO/13	16.2	20	12	60.0											still to shallow on fatho. when compared to 1978.
13. 05	16.1				NL	—	5	—	73/93						fathogram unusable for gouge depth measures
13. 15	16.0				NL	—	8	—	93/113						
13. 20	16.1				NL	—	8	—	60/80						
13. 60	16.6									NL	4	—	42	57/77	
13. 65	16.7									NL	2	—	12	00/20	sinuous but parallels trackline. Continues into next segment.

TESTLINE: 9 | **JULIAN DATE:** 237 | **YEAR:** 1978-1982 | **TEMPLATE IDENTIFICATION:** 1 : 1.379

TRACKLINE NUMBER: 1					Length	SINGLE GOUGES				Length	MULTIPLET GOUGES				COURSE: 020°T
SEGMENT	WATER DEPTH (M)	TOTAL GOUGES	TOTAL NEW GOUGES	%	NEW SINGLE GOUGES	GOUGE DEPTH (M)	GOUGE WIDTH (M)	RIDGE HEIGHT (M)	Ø (°T)	NEW MULTI. GOUGES	NUMBER OF INCIS.	DEEPEST INCISION (M)	DISRUPT WIDTH (M)	Ø (°T)	COMMENTS
13.90	16.8				NL	—	5	—	65/85						
13.90	16.8				NL	—	9	—	29/49						continues into next segment.
13.99	17.0				NL	—	7	—	127/147						continues into next segment.
OP/14	17.0	26	16	61.5											
14.01	17.0				NL	—	9	—	29/49						
14.01	17.0				NL	—	7	—	127/147						continued from previous segment
14.01	17.0									NL	2	—	12	00/20	
14.15	17.1				NL	—	10	—	81/101						
14.20	17.1				NL	—	7	—	82/102						
14.20	17.1									NL	2	—	8	128/148	
14.25	17.2				NL	—	5	—	07/27						
14.30	17.2				NL	—	10	—	77/97						
14.60	17.4									NL	5	—	53	51/71	
14.85	17.5				NL	—	7	—	162/02						
PQ/15	18.2	12	7	58.3											fathogram now ~ 2.0m too shallow at scale chg.
15.20	18.2				NL	—	5	—	58/78						
15.50	18.4				NL	—	11	—	105/125						
15.55	18.3				NL	—	13	—	125/145						
15.75	18.6				NL	—	8	—	173/13						
15.85	18.5				NL	—	15	—	177/17						
15.90	18.6				NL	—	8	—	84/104						
15.95	18.7				NL	—	9	—	88/108						
															end of good navigation
Q/end	18.7														